

# THE ATOM

los alamos  
scientific laboratory  
OF THE UNIVERSITY OF CALIFORNIA  
LOS ALAMOS, NEW MEXICO

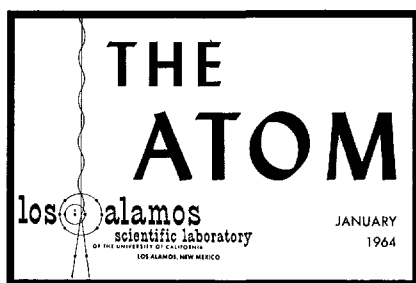
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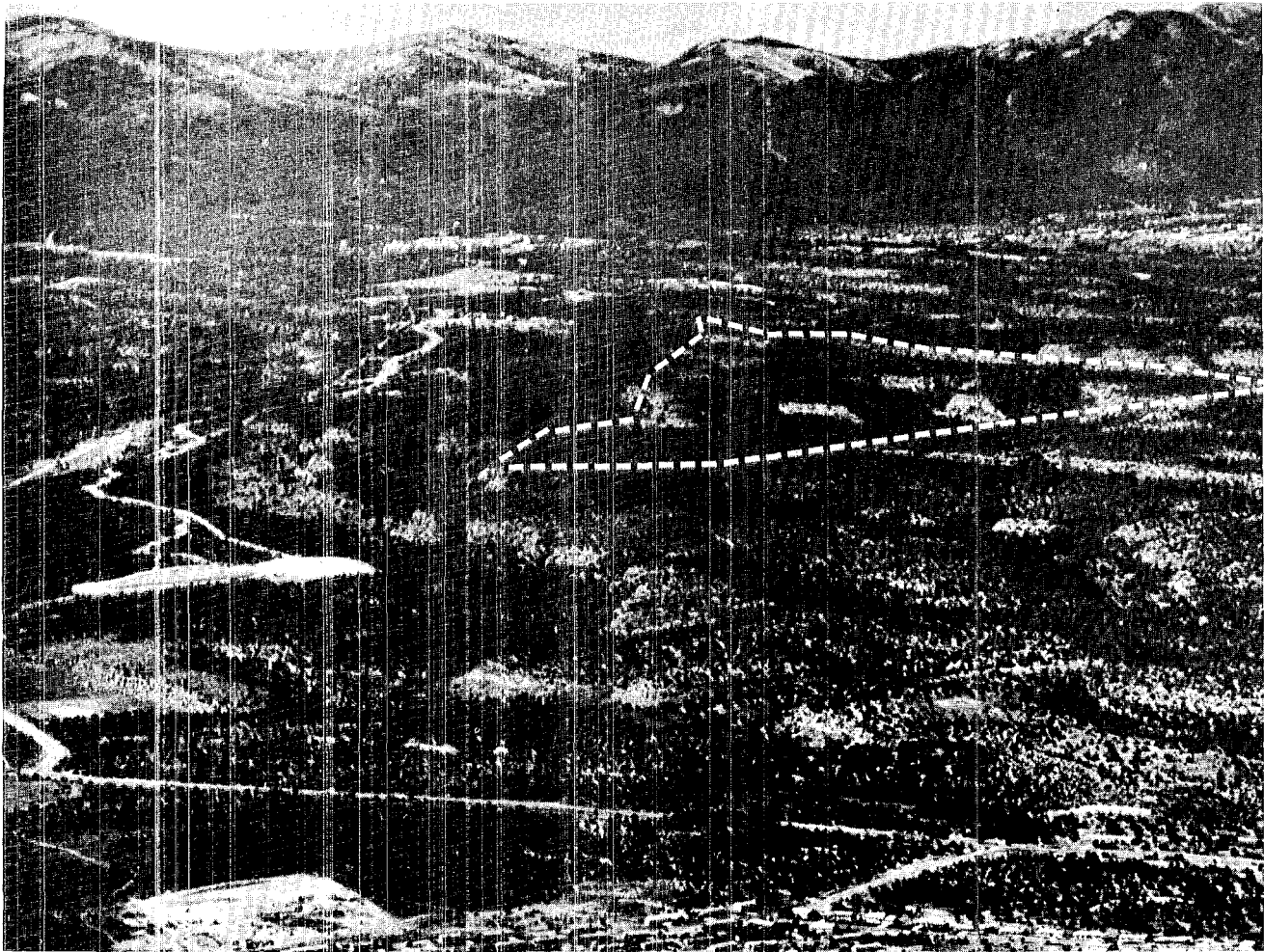
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**ON THE COVER:** Photograph is the track of a cosmic particle found in an emulsion stack flown at an altitude of 110,000 feet in a balloon launched from Los Alamos. A fast heavy particle of primary cosmic radiation (possibly an iron nucleus), coming in from the top of the picture, collides with a nucleus of the emulsion and is shattered. The collision gives rise to a jet of fast light particles traveling along the original direction of the heavy primary. The track is one of thousands collected in P-10 high altitude studies and analyzed by microscopists supervised by Alice H. Armstrong. The story of Miss Armstrong and her thirty years in physics appears on pages 18 and 19.

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an equal opportunity employer,  
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Outlined are the approximate boundaries of the island of Sandoval County, the result of a mischance in mapping or surveying back in 1949.

## THE LOST ISLAND OF SANDOVAL COUNTY

Now you wouldn't think, off-hand, that several hundred acres of land in these parts could be mislaid, even if it is mostly juniper, piñon and jack-rabbits, with a sprinkling of Indian ruins.

Actually, the land is not really mislaid—it has been there all the time—it has merely been forgotten.

When Los Alamos county was hacked out of Sandoval county back in 1949, by some mischance in mapping or surveying, a triangular piece of Sandoval county was left over, an

island entirely isolated from its parent. It lies up against the Santa Fe county line, at the northeastern part of Los Alamos county, directly north of Pajarito Site.

No road or established trail enters it, although some of the Laboratory roads on Mesa del Buey come close. An old woodcutters road, no longer in use, skirts a corner in upper Mor-tendad canyon. Cedro canyon heads up the triangle.

The island might be a bone of contention by three counties if it were

accessible, and worth anything. It could also offer some interesting possibilities in law enforcement, or tax collecting. Bandits hiding out there could dodge the sheriff by ducking over the nearest county line in a few jumps. Just think: it would take a three-county posse to stage a round-up, with the Indians cutting them off at the pass!

Notice to hermits, homesteaders and would-be bootleggers: All of this is sacred Indian land, held in trust by the U. S. Department of the Interior for the San Ildefonso pueblo because of the many small ruins in the area. It probably can never be used for anything, which is the main reason nobody has worried about it all these years.

# Short Subjects

**Civil Defense** and the Los Alamos protective force share a new nerve center in Station 100, the AEC security force headquarters and communication center behind South Mesa cafeteria, as the result of an extensive remodeling program just completed. In place of the cramped basement room used since 1953 for the communications center, a new, large, well lighted and completely equipped center will be put into operation shortly. The roof has been strengthened to provide standard fallout protection, so the center can be manned during a fallout emergency.

**The AEC has accepted** proposals from three New Mexico real estate developers as bases for negotiating contracts to develop new residential subdivisions at White Rock. The firms are Allen Stamm & Associates, Inc., Santa Fe; Home Planning Development Co., Roswell; and Thunder Mountain Construction Company, Santa Fe.

**Mesa Public Library** at Los Alamos went on a seven day a week schedule January 4. Formerly closed Saturdays, the library's doors will be open on that day from 9 a.m. until 1 p.m. Sunday hours will continue to be 1:30 p.m. until 5:30 p.m. Weekday hours are 11 a.m. to 9 p.m.

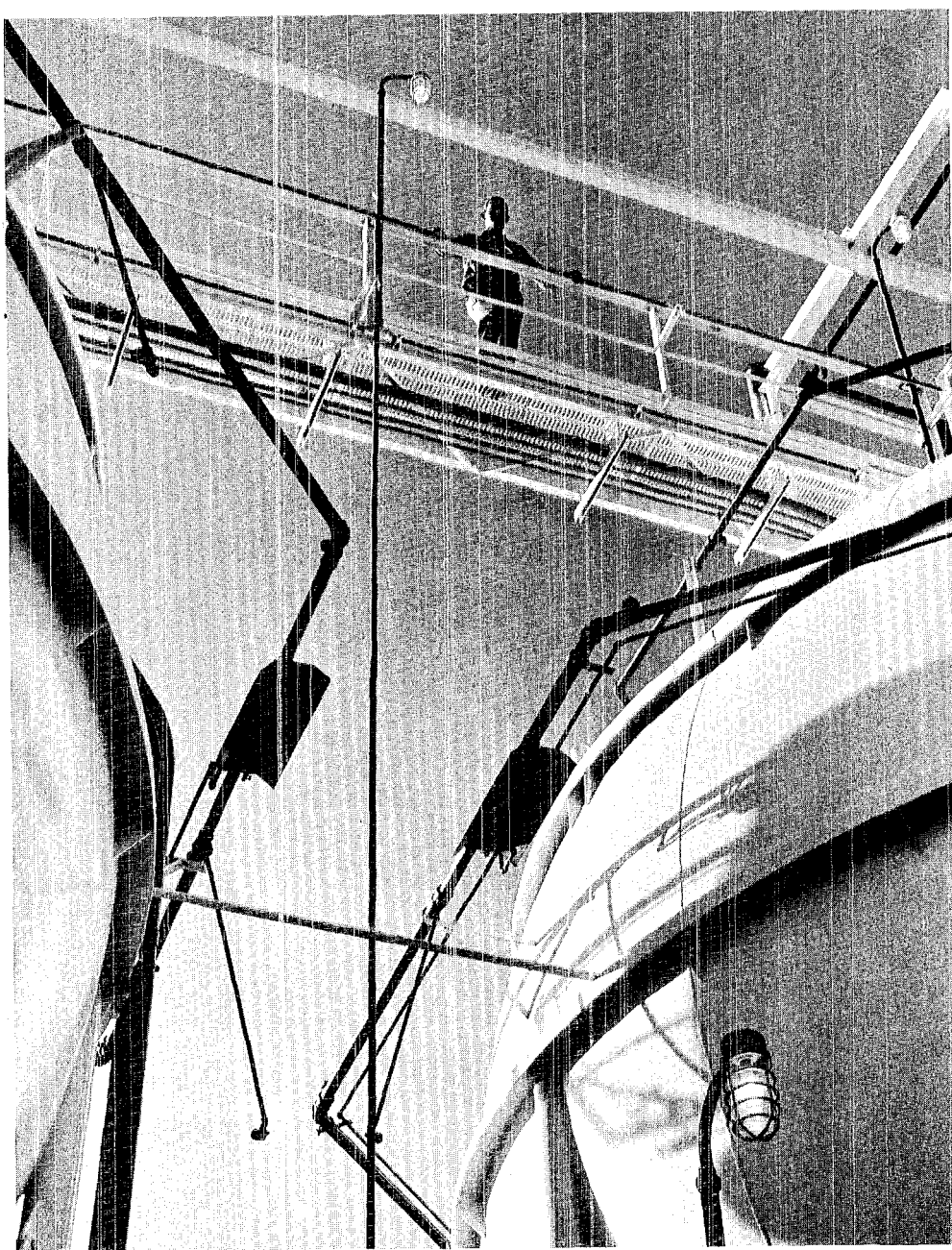
**Invitations are out** to several hundred high school science seniors from New Mexico and surrounding states to attend the Laboratory's seventh annual Edison Day observance, February 13 and 14. The event is part of a national program to stimulate interest in careers in science, engineering and education. Students will hear a talk by Norris Bradbury, LASL director and will tour the Health Research Laboratory, the Physics Building and the Project Sherwood facility.

**The first major action** in the Los Alamos community disposal program was completed December 31, when ownership of the Los Alamos Medical Center was passed from the AEC to the Lutheran Hospitals and Homes Society of America, Inc. Transfer of the nearly two-million-dollar property to the nonprofit corporation was in accordance with the results of a community referendum held in June of last year.



**Mrs. Sally M. Gerety**, AEC attorney, assumed the post of Counsel in the AEC's Los Alamos Area Office last month, replacing James P. Hogan who resigned recently. The principal legal adviser on the staff of Area Manager Charles C. Campbell, Mrs. Gerety came to the Atomic City from Richland, Washington, where she was assistant chief counsel with the AEC's Richland Operations Office.

**Dedicatory services** for the Nevada Test Site all-faiths chapel was held December 8 at Mercury, Nevada. Constructed at a cost of about \$140,000, the concrete masonry building was one of the first structures to be completed in a \$6,000,000 program of permanent construction at the base camp for NTS. It is also the first building reserved for religious purposes in Mercury's 12-year history.



Bob Stokes, of LASL's Cryogenic Evaluation Laboratory, stands on the catwalk between the two 55,000-gallon hydrogen dewars at Test Cell C.

DESPITE A REVISION IN THE PROGRAM,  
1964 WILL BE A

# BIG YEAR FOR ROVER

BY PETER MYGATT

Project Rover activity was higher during 1963 than at any other time in the nuclear rocket program's eight year history, and despite a revision in the program it appears that 1964 will see a new peak of activity at the Nuclear Rocket Development Station in Nevada.

In announcing the revision of the program, the AEC and NASA stated that the Los Alamos Scientific Laboratory's part in Project Rover will continue during 1964 with virtually no changes. The Laboratory will continue its Kiwi reactor tests during calendar 1964, and at the same time will increase its design and technology effort in the area of high-powered graphite reactors, a project known as Phoebus.

The revised AEC/NASA Rover program places emphasis on ground-based research and engineering, and defers further development of flight systems.

Five reactor tests — two cold flow tests and three hot runs — have already been scheduled for the first six months of 1964. The first cold flow test will be that of a LASL Kiwi B-4D, now being assembled at NRDS, and this will be followed by a hot run of a similar reactor. LASL will also hot-test a second reactor, Kiwi B-4E, about mid-year.

The Project Rover revision means further that the 1,000 megawatt NERVA (Nuclear Engine for Rocket Vehicle Application) will continue, but with its flight objective deferred, and that RIFT (Reactor In Flight Test) is cancelled. RIFT, which was being developed by Lockheed Missiles and Space Company, has been a technological project without actual hardware development to date.

The Aerojet-Westinghouse NERVA team has been working on NRX (NERVA Reactor Experiment) reactors based on LASL Kiwi designs. During the past year the NERVA team has fabricated NRX-A1, a cold flow reactor based somewhat on Kiwi B-4A as redesigned. NRX-A1 arrived at NRDS from Pittsburgh, Pa., on November 19, 1963. Following test car assembly, this reactor will under-

continued on next page

# Big Year Ahead For Rover

continued from preceding page

go cold flow experiments early in 1964, with hot NRV experiments planned sometime in mid-1964.

The Rover revision provides funding for continued development of nuclear propulsion and at the same time, by deferring flight systems and tests related to NERVA and RIFT, will save as much as \$180 million of planned and programmed funds in fiscal 1964 and 1965. The AEC and NASA explained that the continuing ground development will be directed toward ultimate use in flight systems.

LASL's first Rover reactor, Kiwi A, was tested on July 1, 1959. It was followed by the testing of Kiwi A Prime, July 8, 1960; Kiwi A3, October 19, 1960; and Kiwi B-1A, December 7, 1961. These first four reactors used gaseous hydrogen as the propellant/coolant. On September 1, 1962, Kiwi B-1B proved that liquid hydrogen could safely be used. This was confirmed by the hot test of Kiwi B-4A on November 30, 1962.

Because no hot runs were scheduled during 1963, the Rover program came

in for some public criticism. However, Dr. Raemer E. Schreiber, LASL Technical Associate Director, noted: "People tend to forget — if they ever properly realized — the fact that the early Kiwi A tests in 1959-60 and the first two Kiwi B tests in 1961-62 represented fairly bold exploratory operations. We were operating with a relatively small budget and organization for a project of this magnitude and did not take the time and money to study all of the possible problems we might encounter.

"These reactor tests were extremely useful in putting to rest a whole host of problems which we might otherwise still be worrying about." Dr. Schreiber said a prime example of the problems one might still be facing had not tests been conducted, is the liquid hydrogen startup problem. "It really looks terrible from an analytical standpoint but both the Kiwi B-1B and Kiwi B-4A ran beautifully as far as hydrogen stability was concerned. This does not mean that each reactor ran perfectly or that all problems

were solved. On the contrary, each reactor showed problem areas in materials or designs which had to be solved."

In spite of materials development, the B-1B reactor showed a weakness of core structure indicated in earlier tests. A shift to the B-4 design avoided the B-1B problem, but an unanticipated seal leakage permitted the core to vibrate, so the power test was terminated fairly early in the run.

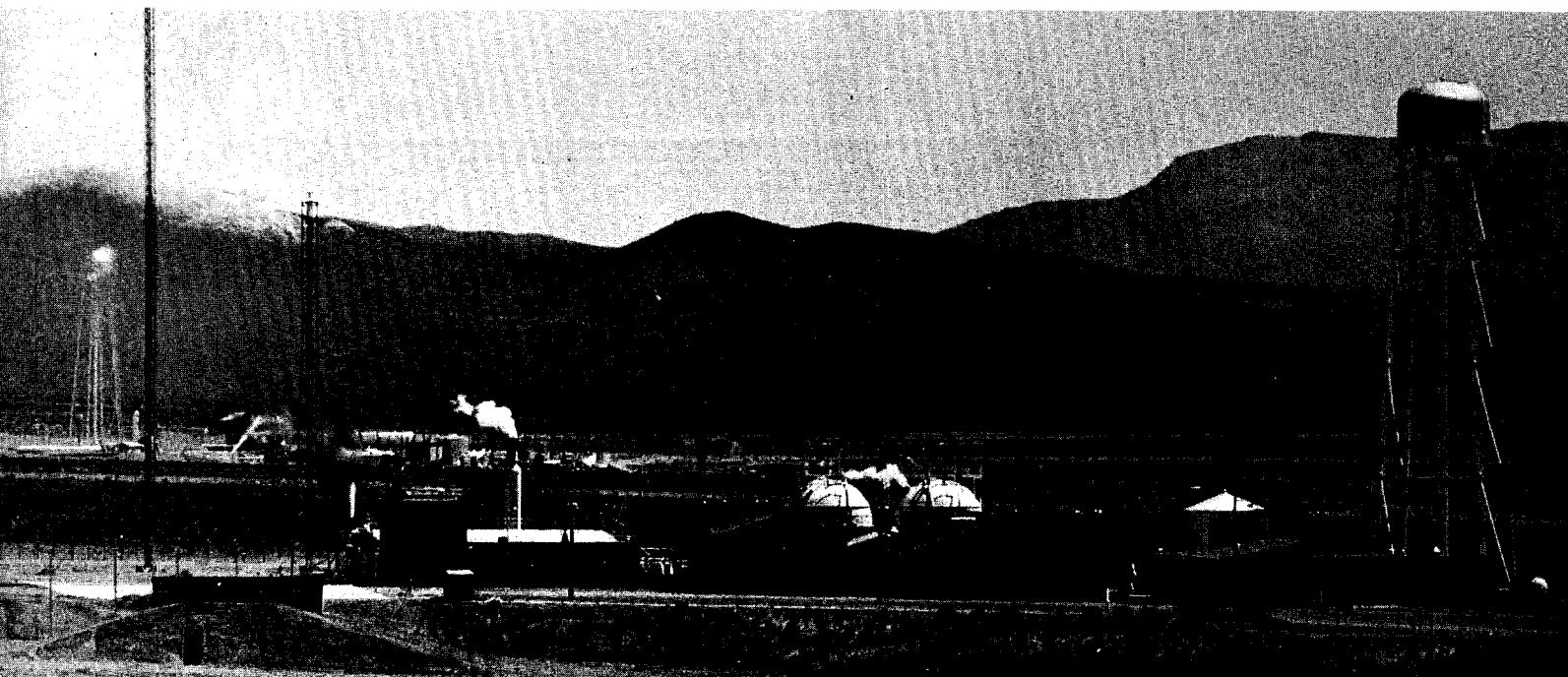
"It was of course disappointing that this happened," Dr. Schreiber said, "but it is simply an engineering problem which must be solved. We feel the B-4 design is the best one presently available so we have been busy solving this seal problem and demonstrating that it is solved. Once a problem of this type is identified, it requires time to find a solution and build new hardware."

As a result of these findings, the reactor core supporting structure was redesigned, and on August 21, 1963, LASL conducted cold flow tests on Kiwi B-4B, which showed that design modifications will prevent, under cold flow conditions, the excessive vibrations experienced in Kiwi B-4A.

In July, a Kiwi B2 with a different design solution to the core support problem was successfully cold flow tested.

Dr. Schreiber said if the Kiwi

A Kiwi reactor cold flow test is all but swallowed up in the vastness of Jackass Flats, Nevada. The reactor is just to the left of Test Cell C in foreground. Heat waves, caused as the hydrogen is burned, appear to distort the test cell A complex and water tower in left background.



B-4 and NRX tests during the next several months work out as hoped, Aerojet-Westinghouse will continue the NERVA development and LASL "will move on to the Phoebus advanced graphite reactor program." Some 475 people at LASL are working on the Kiwi B-4 design development and preliminary Phoebus studies.

The nuclear powered rocket business was formally established at LASL on April 15, 1955, and since that time scientific and technological aspects of the program have been primarily the responsibility of LASL. Rover was set up first under the auspices of the U.S. Atomic Energy Commission. However, it is now administered by the Space Nuclear Propulsion Office, a new government agency staffed by personnel from the AEC and the National Aeronautics and Space Administration, and reporting to the AEC and NASA.

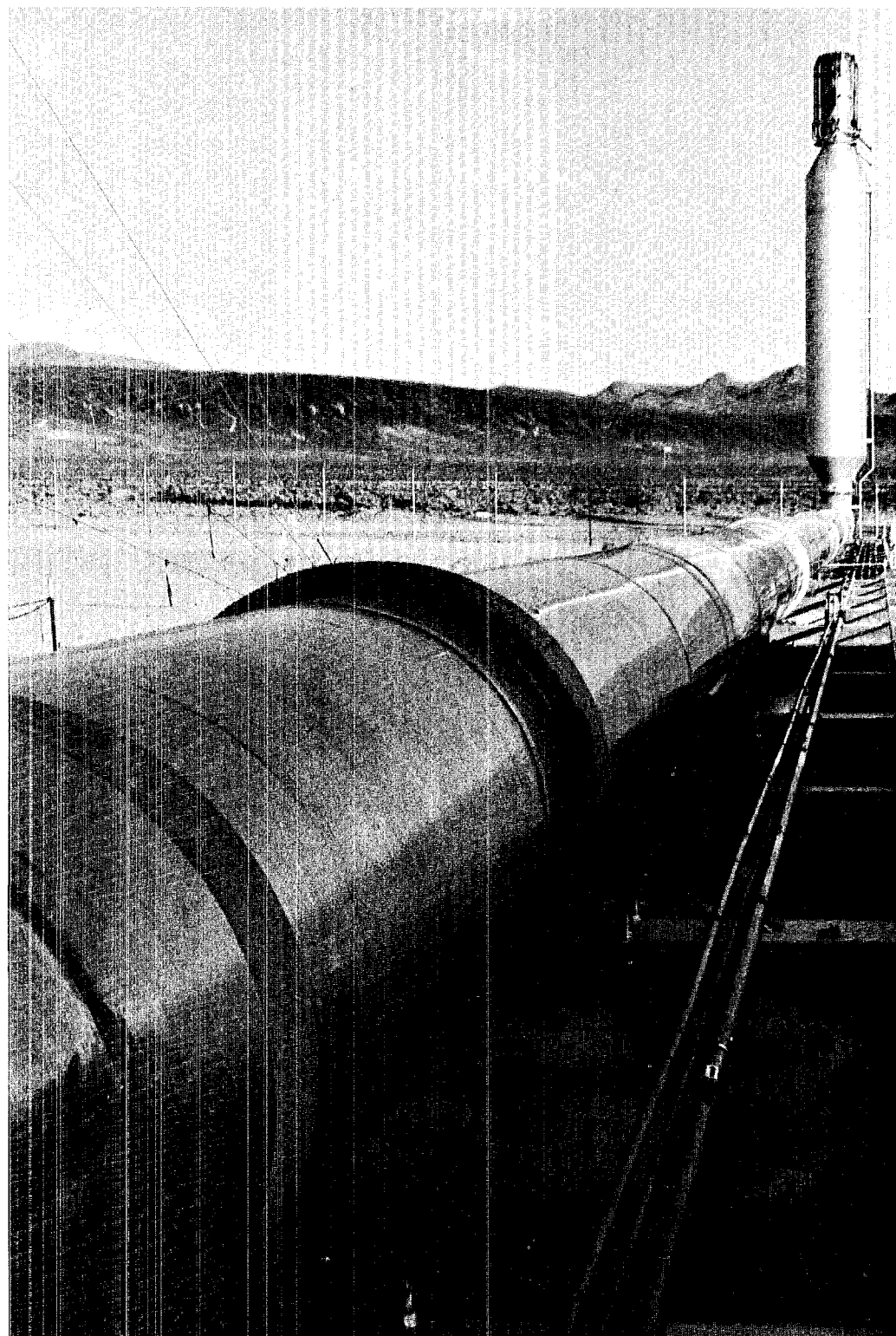
Heat exchanger reactors, as are being designed in the Rover program, appear to be the simplest application of nuclear energy to rocket propulsion. These are essentially gas-cooled reactors, that is, reactors that have many coolant passages in the cores through which gas is pumped to remove the heat generated by the fuel elements. In a heat exchanger reactor of this sort, the hot gas is discharged at high velocity through a fairly conventional rocket nozzle at the rear of the reactor, providing the forward thrust for the vehicle. The thrust is proportional to the mass flow rate of the coolants gas (or propellant) and to its exhaust velocity (or specific impulse). In actual applications, the propellant (which is the lightest of all elements - hydrogen) is stored as a liquid and is vaporized by the reactor during the heating cycle.

A thrust of 100,000 pounds, for example, requires a power of about 2,000 megawatts, or two million kilo-

watts—considerably more than the electrical requirements for the city of Washington, D.C. Since this power plant must be carried along in the vehicle, it must be as light as possible. In more technical terms, the power density of the engine must be very high. The specific impulse of the propellant (the pounds of thrust obtained per unit of mass flow rate) is a very important figure and increases as the temperature increases. The propulsion

reactor, therefore, must operate at the highest temperature possible. Consequently, the Kiwi reactors, which are considerably smaller than an automobile, are being designed to generate enormous amounts of power and operate at temperatures approaching 4,500 degrees F.

It appears generally possible for nuclear engines to achieve about twice the all-important specific impulse of the best chemical systems.



As a safety measure, at the completion of a Kiwi reactor test excess hydrogen propellant is purged from Test Cell C piping at this burnoff stack.

# **NRDS in Midst of Major Construction Effort**

Nearly 1,300 people daily swarm upon the Nuclear Rocket Development Station in Nevada, but in the expanse of the sagebrush covered Jackass Flats their number goes almost unnoticed.

These people—including scientists, engineers, construction workers, administrative personnel, and other support personnel—are necessary, for to keep pace with the projected accelerated reactor of Project Rover a major construction effort has been under way. Engine development facilities must be ready for complete engine systems tests when reactors have been developed and tested sufficiently to warrant use in such tests.

Modifications, including the addition of a 100,000-gallon liquid hydrogen Dewar storage vessel, have been made to reactor Test Cell A to equip it for testing NRX (NERVA Reactor Experiment) reactors. This test cell has previously been used for hot testing six LASL Kiwi reactors, and is now being transferred to the NERVA contractor team for testing their reactors.

Four additional hot cells for post mortem examination of radioactive reactor cores and components have been added to the R-MAD (Reactor—Maintenance, Assembly and Disassembly) building, and a warehouse extension and a vehicle and equipment decontamination building have been constructed in the R-MAD area.

During July, 1963, C. F. Braun and Co., Alhambra, Calif., was selected to perform architect-engineer design services on a proposed modification of LASL's Test Cell C. The modi-

fication will permit high power reactor tests to be run at that facility. In addition, the Braun company will perform conceptual studies for a proposed new test cell, Test Cell E, which will be required for reactor tests in the 10,000 to 20,000 megawatt thermal power range.

Construction began October 31, 1963, on a \$2.2 million Space Nuclear Propulsion Office administration and engineering building at NRDS to house SNPO, LASL, and other nuclear aerospace contractors concerned with Project Rover. The new structure will be an air conditioned, two-story building constructed of steel frame and precast concrete panels. It is scheduled for completion in 1964 and will provide approximately 52,000 square feet of floor area.

On June 28, 1963, SNPO-Nevada negotiated a contract with the Guided Missile Range Division, Pan American World Airways, Inc., for maintenance and support operations at NRDS, and since July 1, Pan Am has been engaged in this activity.

During 1963, LASL set up three laboratories at NRDS to provide component reliability programs for the Rover testing effort. The first of these is the now fully-operational Equipment Testing Laboratory located near Test Cell A. Among the ETL facilities available for testing mechanical systems and components are a water flow system, gas flow system, and static test bay.

David L. Harris, LASL J-7 and who heads up the ETL group, noted that typical jobs which can be performed by the two flow systems in-

clude: flow calibration of valves, meters, and other pipeline components; valve life tests under operating conditions; calibration of flow meters; dynamic response tests of valves and other components under flow conditions; evaluations of instrumentation systems; and fluid hammer studies.

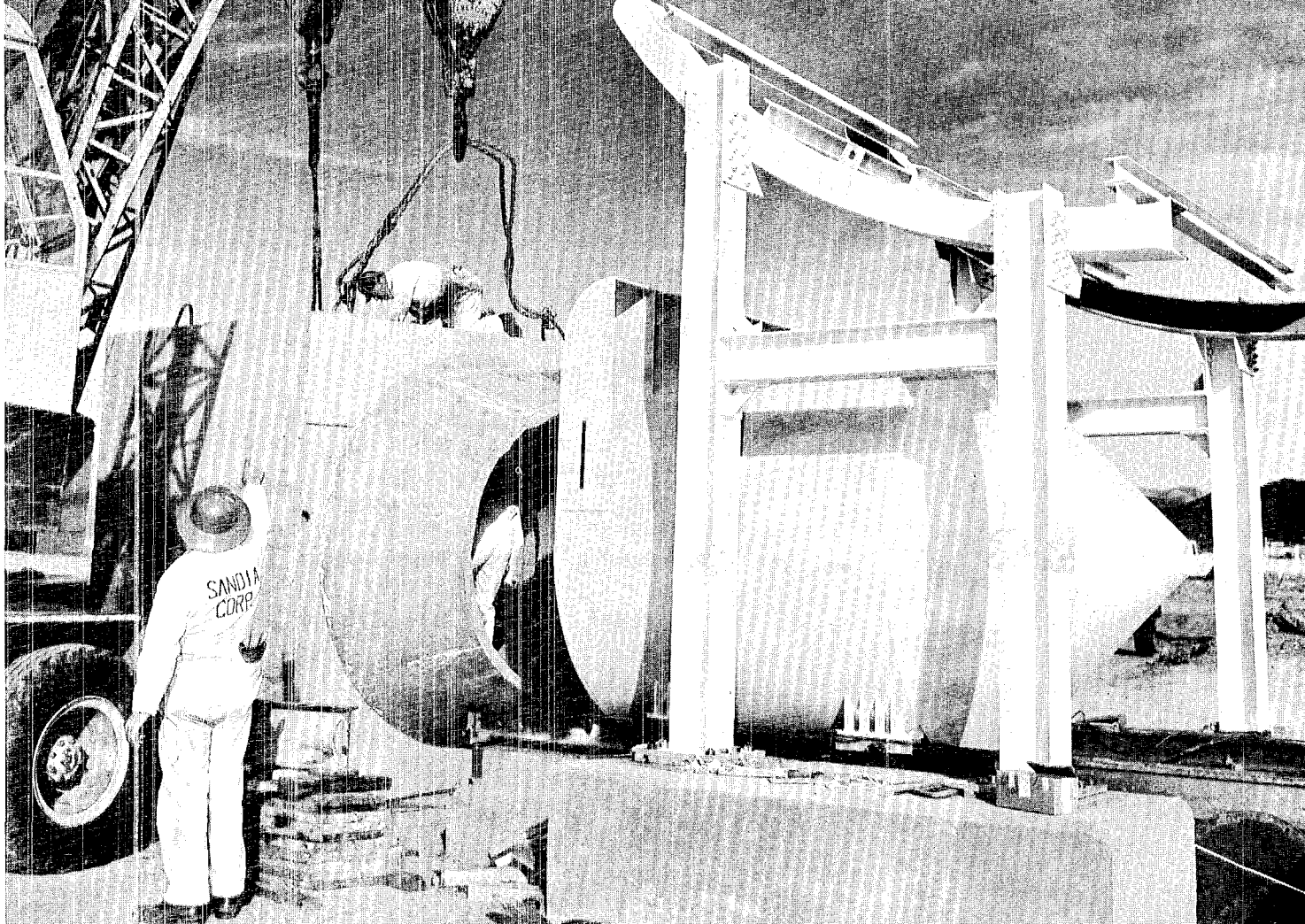
The static test bay, using pressures ranging from 150 pounds per square inch for air, up to 30,000 psi for water, performs such jobs as: leak testing of valves and other components; proof pressure testing of hoses, valves, etc.; burst testing of hoses and other components; actuation tests of pneumatic or hydraulic cylinders and valve actuators; setting and checking of relief valves; field gage calibration; and evaluation of pressure regulators.

Harris pointed out that one of the most interesting jobs his group performs is the evaluation of new components, and he sees this as an expanding function of ETL.

One of the newest laboratories at NRDS is J-5's Systems Quality Assurance Program group, headed by Don C. Tait, which has been in operation for about six months. Tait explained that his group specializes in piping systems components. At present component cleaning operations at the ETL are being carried out under the direction of Tait's group which is temporarily located at ETL.

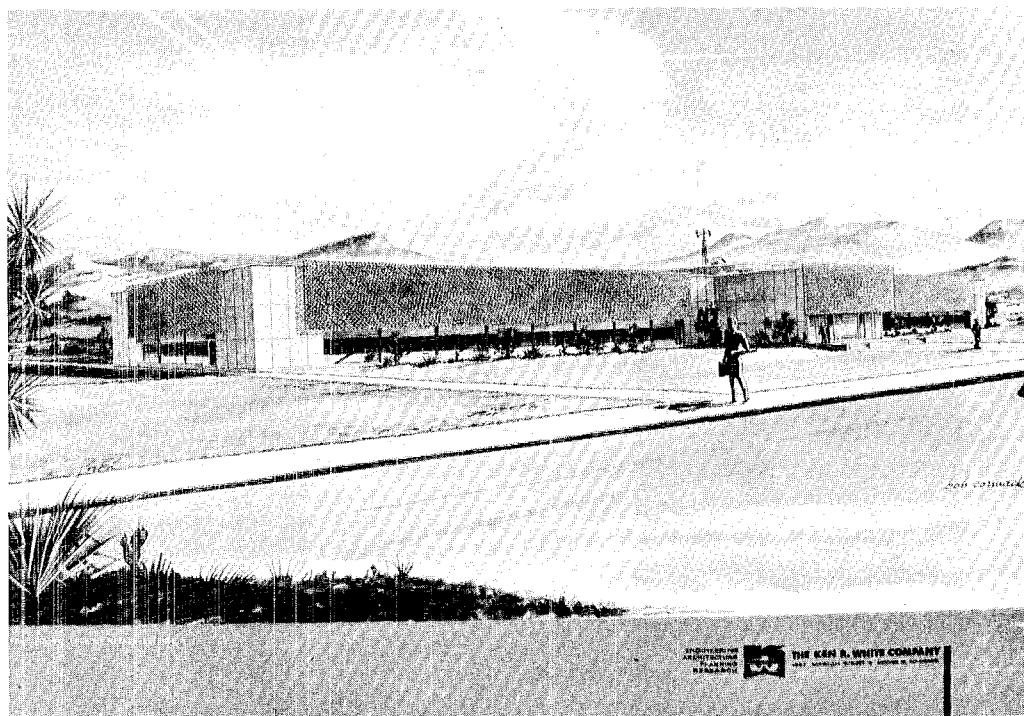
In explaining his group, Tait said LASL is operating cryogenic equipment at temperatures far below design criteria. Industry may rate a system at minus 10 degrees F. for cryogenic use, while LASL scientists may push that same system, out of necessity, to minus 423 degrees F. Tait said his group must repair and maintain parts and components to meet the rigid specifications of the Rover testing program. High pressure valves, cryogenic control valves, and propellant hardware—excluding instrumentation—must meet the standards set up by the Quality Assurance Program group, and in this line Tait's group has already established an NRDS welding specifications standard. The

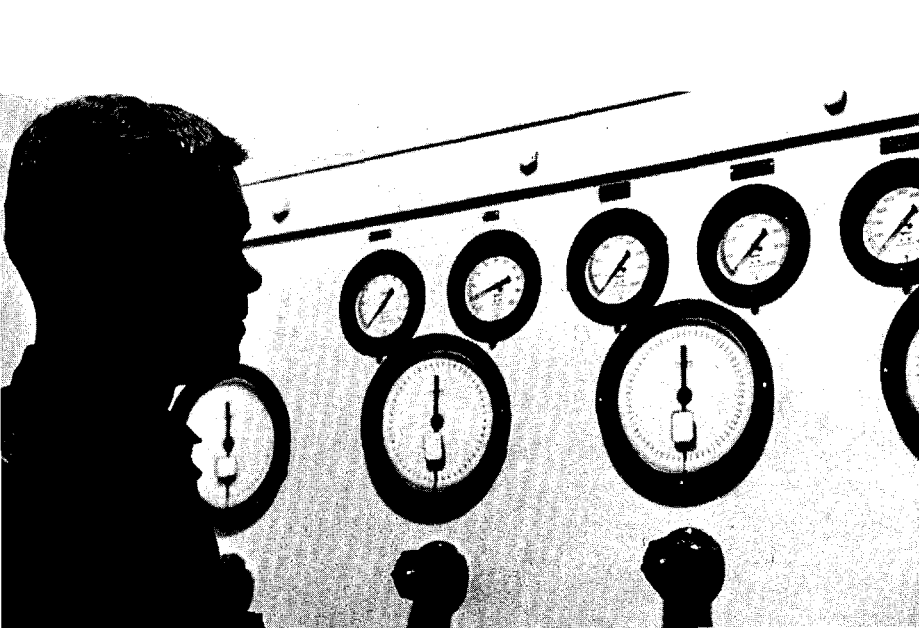
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Undergoing a series of tests, utilizing Sandia Corporation's rocket sled track, are the nozzle and simulated core plate of a LASL Kiwi Reactor. Parts to be tested are suspended inside the 44-ton reinforced concrete container to the left. Conical container holds 2000 gallons of water and will be propelled down track on a rocket sled. At pre-determined point, metal superstructure rips off door of cone-shaped container, and water is propelled by its own momentum into concrete container.

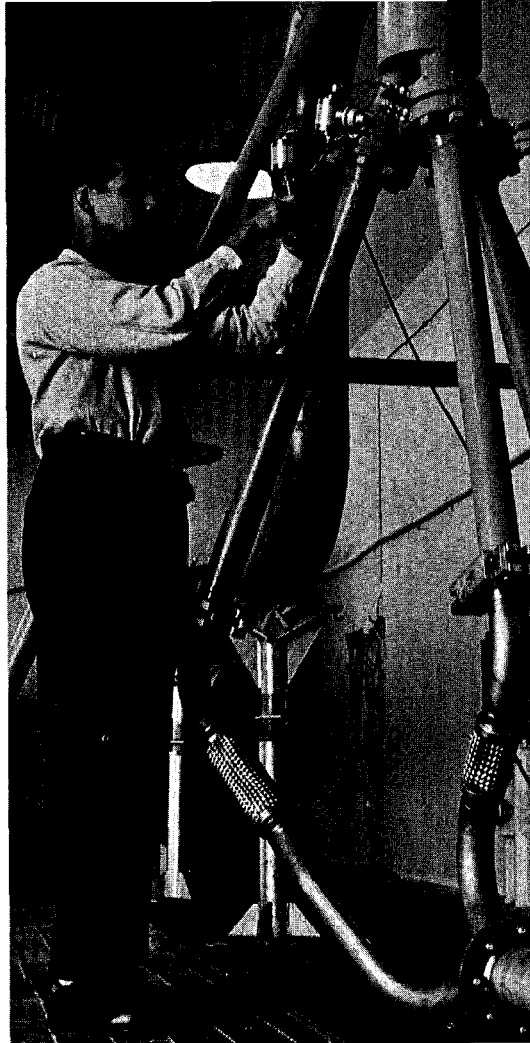
Artist's conception of new SNPO Administration and Engineering Building now being constructed at NRDS, Jackass Flats, Nevada. Sierra Construction Co., of Las Vegas, Nevada, was awarded the \$1,198,876 contract for construction of the 52,000-square-foot, two-story building scheduled for completion this year.





Dave Wright, APCI employee at NRDS assigned to J-7's Equipment Testing laboratory, inspects the ETL control board.

Loren Jones, J-7, at LASL's Equipment Testing Laboratory, works on a Kiwi reactor nozzle "spider" which is connected into ETL's high pressure loop. The three-legged spider feeds liquid hydrogen into the reactor nozzle.



## NRDS . . .

continued from page 6

group, which also operates an ultrasonic cleaning facility, provides components for microscopically clean hydraulic systems.

The third reliability group is the Cryogenic Evaluation Laboratory, headed by Bob Stokes of J-5. Stokes explained that the function of the CEL is to conduct full scale tests upon valves, flow meters, and structural components used in support of the Kiwi testing program. The CEL, located at Test Cell C, uses a cryogenic test loop connected directly to the two 55,000-gallon liquid hydrogen dewars at the test cell. The loop can test components from essentially zero pressure up to about 1,200 psi.

However, the concept of testing goes further than that of reliability tests of components, and of cold flow and hot tests conducted on Kiwi reactors. One such test, scheduled in the fall of 1964, may produce the most spectacular reactor excursion in his-

tory. This experiment, to be known as SWET (Simulated Water Entry Test), will involve a Kiwi reactor. The test calls for the injection of a column of water into the open end of a Kiwi reactor at a velocity simulating that resulting from ocean disposal of a reactor, Dr. L. D. P. King, LASL Rover Flight Safety officer, explained.

Special NRDS facilities are being constructed for the SWET experiment, including an 80-foot diameter water tank which will be about 20 feet deep at the center. The reactor will be suspended over the center of the tank, and a water gun will ram a column of water into the reactor.

Water is an excellent reactor moderator and can cause a reactor such as Kiwi to go highly super-critical, thus severely damaging the reactor. Purpose of SWET will be to determine the magnitude of such an excursion and to determine the extent of

the fission fragment dispersal in water and atmosphere if ocean disposal of a rocket reactor were deemed necessary.

Dr. King said SWET is part of a dual LASL program to determine the magnitude of possible launch pad accidents and satisfactory disposal schemes for a nuclear reactor after operation.

Of the 1,300 people at NRDS, more than 100 are LASL Test Division personnel who either transferred from Los Alamos or who were recruited specifically for LASL's NRDS Rover work. Most of these people have been in Nevada for nearly two years. LASL field recruiter Bob Meier, who is also Assistant Personnel Director, stated that obtaining scientific and engineering personnel for LASL work at NRDS posed no real problems, and he added, "perhaps more important, the turnover has been extremely light."

# PORTRAIT OF A PARTICLE ACCELERATOR

AFTER A QUARTER CENTURY OF FAITHFUL SERVICE  
THE "LITTLE VAN" HAS SMASHED ITS LAST ATOM

Once an essential tool for physics research at Los Alamos, a 26-year-old Van de Graaff particle accelerator recently went the way of many an obsolete LASL machine—to the salvage yard.

Like a Model T in a horsepower race, the Little Van, as many called it, lost out to more powerful atom smashers which have become available in recent years to support the growing interest in high energy physics research.

For a while it was the only particle accelerator of its type at Los Alamos but it had become only one of a family of three that was about to become four. Its capacity of 2.8 million electron volts was about one-tenth that expected of the Laboratory's new Tandem Van de Graaff facility now in the building stage.

There were fewer than a half dozen Van de Graaff machines in existence in 1937 when P-9 Group Leader Joe McKibben, then a graduate student, started to build the boiler-shaped thing at the University of Wisconsin. When McKibben led a group of Wisconsin physicists to Project Y early in 1943, he brought the Little Van with him. He and the machine had already been working on the fission problem for more than a year when they arrived on the Hill to work on the development of the atomic bomb.

Along with several other physics research tools which had earlier been borrowed from universities, The Van

de Graaff was purchased by the Laboratory at the completion of the war. It was remodeled considerably but the heart of the Little Van, its accelerating tube, was never replaced after McKibben installed it in 1939. McKibben is studying the tube in hopes of learning why it lasted a quarter century when a typical life span is four or five years.

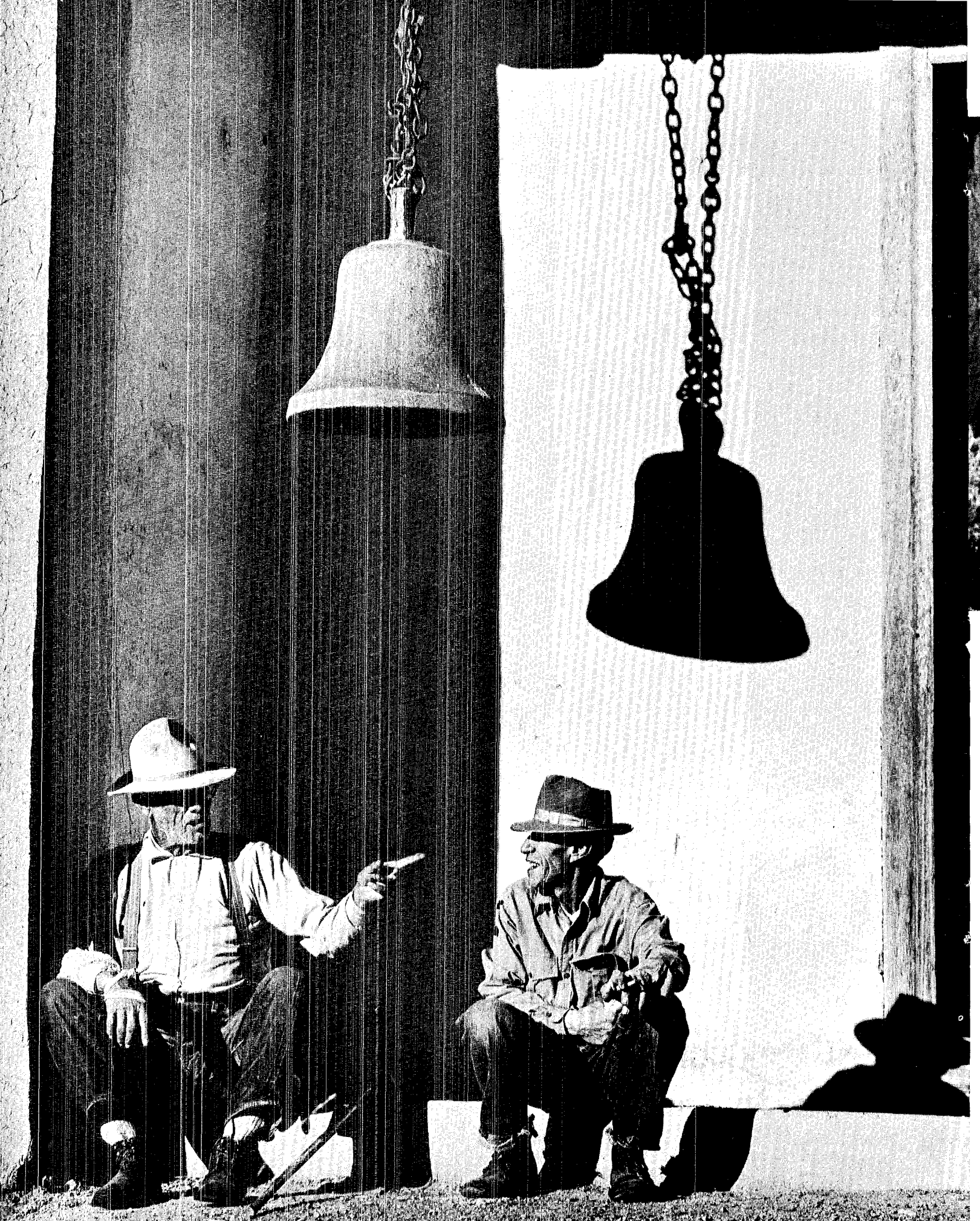
During its long service, the accelerator provided charged particles to give neutrons of various energies for "nearly every conceivable experiment that can be done with neutrons," according to Ben Diven, whose group, P-3, has used the machine most in recent years.

The Little Van's performance helped to hasten its own demise by thoroughly exploring the physics within its energy range. Anything left that it could do can just as well be done with one of the other Van de Graaffs, LASL physicists say.

Frank Tallmadge of P-DO said the Little Van might have found its way into another research laboratory if anyone wanted it. But no one did. Only the inch-thick steel tank—the body of the old machine—has so far found promise of further use at LASL. There's a plan to cut off about a third of it and use the remainder as a vat for precipitating radioactive materials out of liquid waste at DP West. Meanwhile, the Little Van, in a state of disassembly, waits at the Zia Company Salvage yard.



Zia Company riggers hoist the Little Van aboard a truck for the trip from LASL's Physics Building across town to the Zia salvage yard.



# A TASTE (IF YOU HURRY) OF A VANISHING ERA

BY JOHN YOUNG

Photographs by Bill Regan

There are not many places in northern New Mexico where the full flavor of a vanishing Spanish colonial era can still be tasted by the connoisseur of ancient customs, but there are a few left if you hurry.

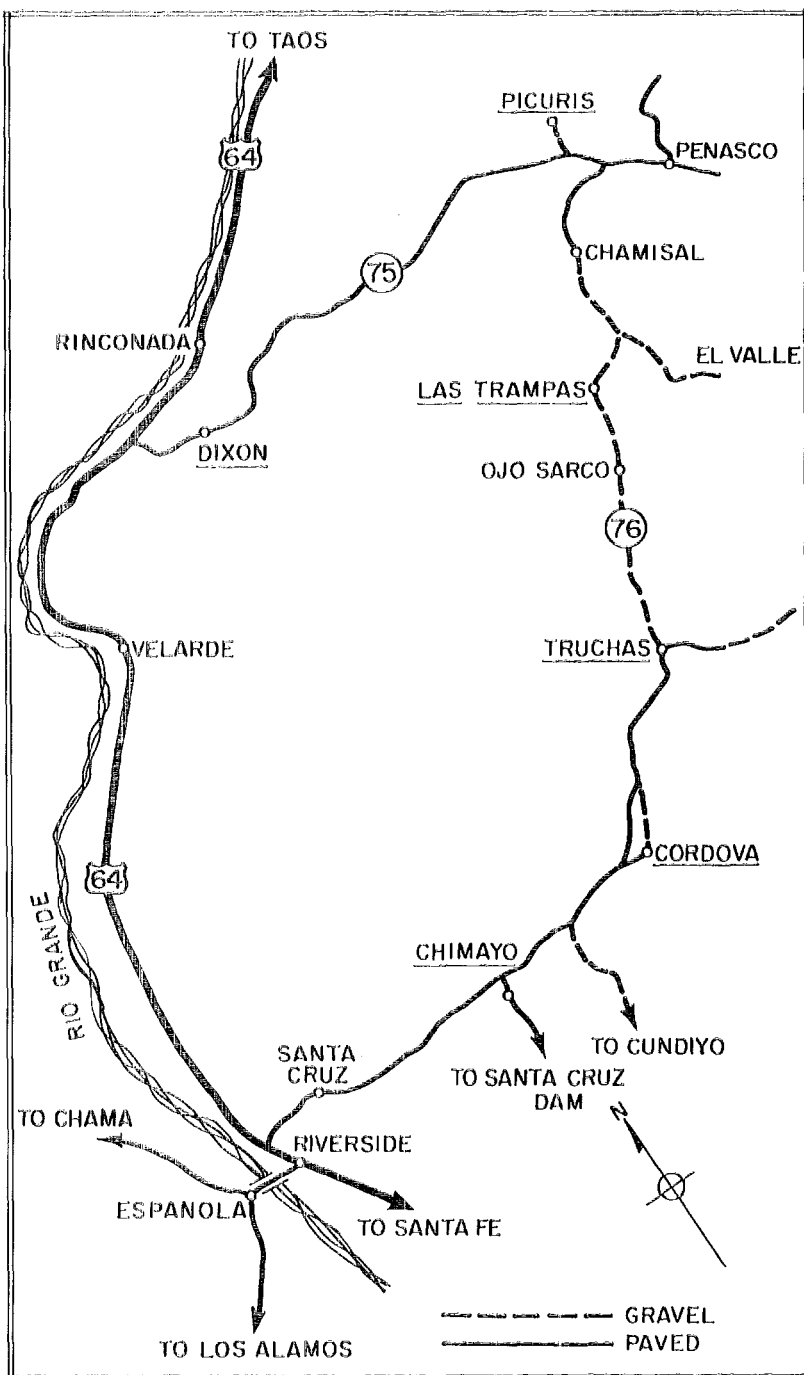
Adobe walls flecked with golden glints of straw still adorn the landscape, but year by year the number of ristras of dark red chili hanging against them to dry in the sun seems to dwindle. It is a rare sight now to see a burro laden with faggots mincing down an arroyo, although piñon smoke still perfumes the clean, crisp air over all the hill villages.

Instead of a goat grazing on a sod roof, bi-lingual road signs, open wooden acequias bringing in the town's water supply, the measured pace of life in an utterly isolated and self-sufficient community, almost everywhere in the hills now there are paved roads and power poles, modern homes and shiny new aluminum roofs, and a jackstraw array of television antennas scrambling for space on the skyline. The pickup has replaced the jackass, and how can a double-bladed axe compete with a gasoline-powered chain saw?

What Los Alamos payrolls have not already done to this picturesque region, the highway department shortly will finish. Completion in the next year or two of the last few remaining unpaved miles of State Route 76

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"Your old men shall dream dreams . . ." Under the shadow of the hanging bell in front of Santo Tomas del Rio de las Trampas church, dating from 1760, a patriarch of the remote mountain village recalls the good old days.



## TASTE OF AN ERA

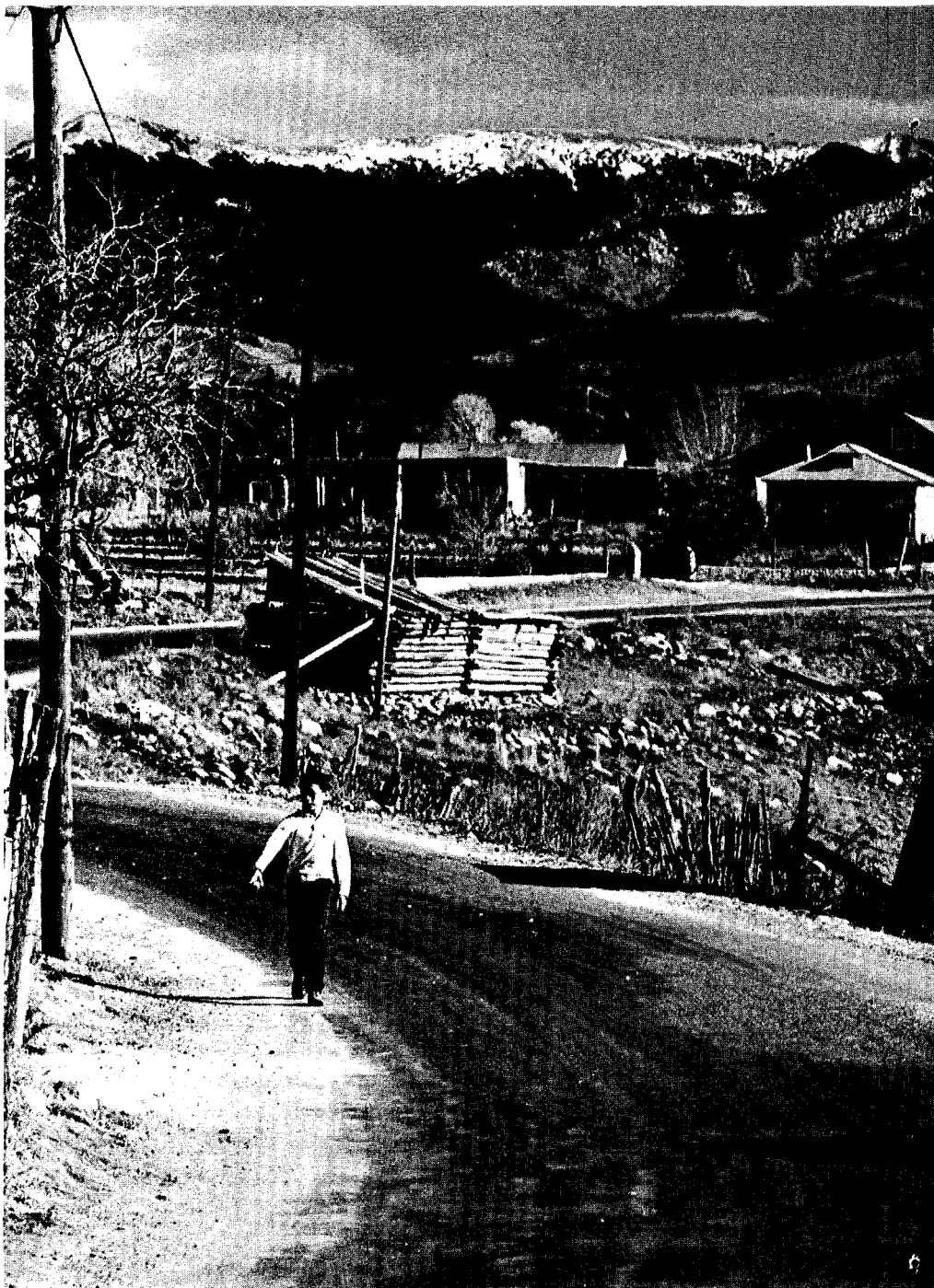
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between Truchas and Chamisal will make an easy Sunday tourist trip out of what used to be high adventure. (It is already, but not many people have found it out yet).

Before it is altogether too late, take the crooked road from Santa Cruz to Chimayo of the weavers, Cordova of the wood carvers, and high lonesome Truchas. Turn left there on the forest road through Ojo Sarco and Las Trampas with its splendid mission church. A mile and a half beyond Trampas, take the turnoff to El Valle if you have the time, for a short side trip to a really remote Spanish-American village. Return to State Route 76, and continue through Chamisal (where the pavement resumes) and turn left again at the intersection of State Route 75, just west of Peñasco. At Rio Lucero take the short side trip to tiny dying Picuris Pueblo, and buy a bean pot while you can.

Swing on down the spectacular asphalt ribbon that has replaced the tortuous old grade to Dixon, and shortly you will find yourself back on the Taos highway at Embudo, a hoot and a holler from Española. From Los Alamos, the round trip is about 115 miles (depending on how many side trips you take), all of it good road and most of it paved. But take all day about it and bring a picnic lunch. There is still much to see.

You will enjoy it more if you read up on the region before you go, or take along the New Mexico WPA Writer's Guide (1940). Although its road information is hopelessly outdated, its information on points of interest is still good, and you can see part of what you have missed by not going sooner. One of the best handy reference pamphlets is Landscape Magazine's Autoguide Tour 1, published in Santa Fe and available in bookstores there. The LASL Community Relations Office also has a limited supply of New Mexico Tourist Bureau maps and literature.

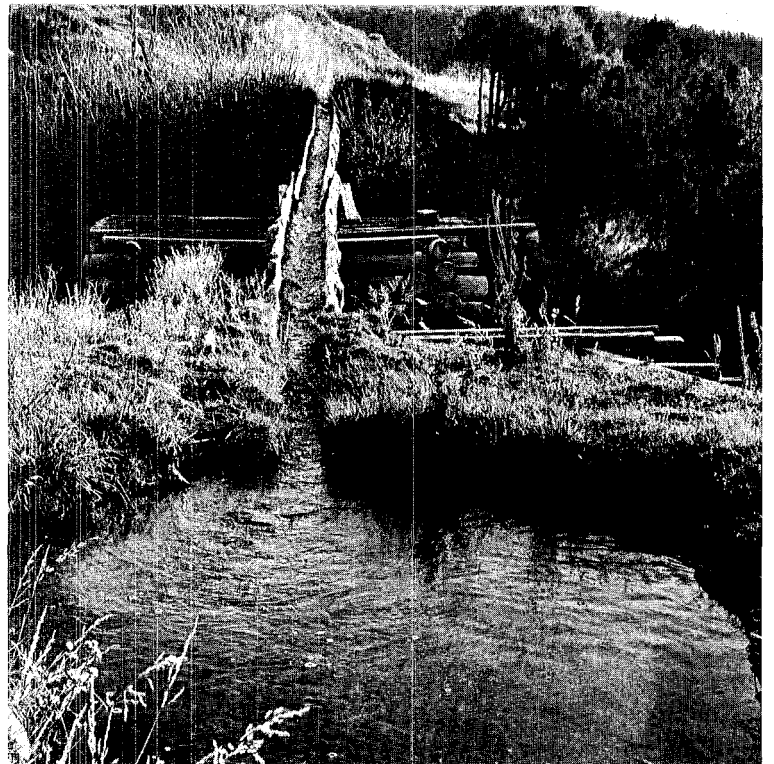
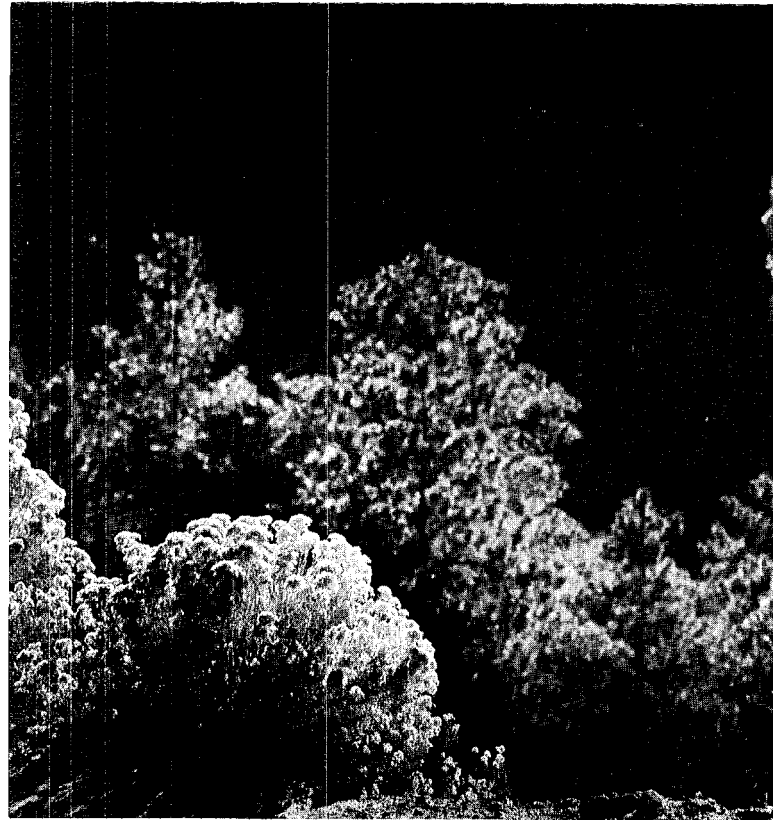
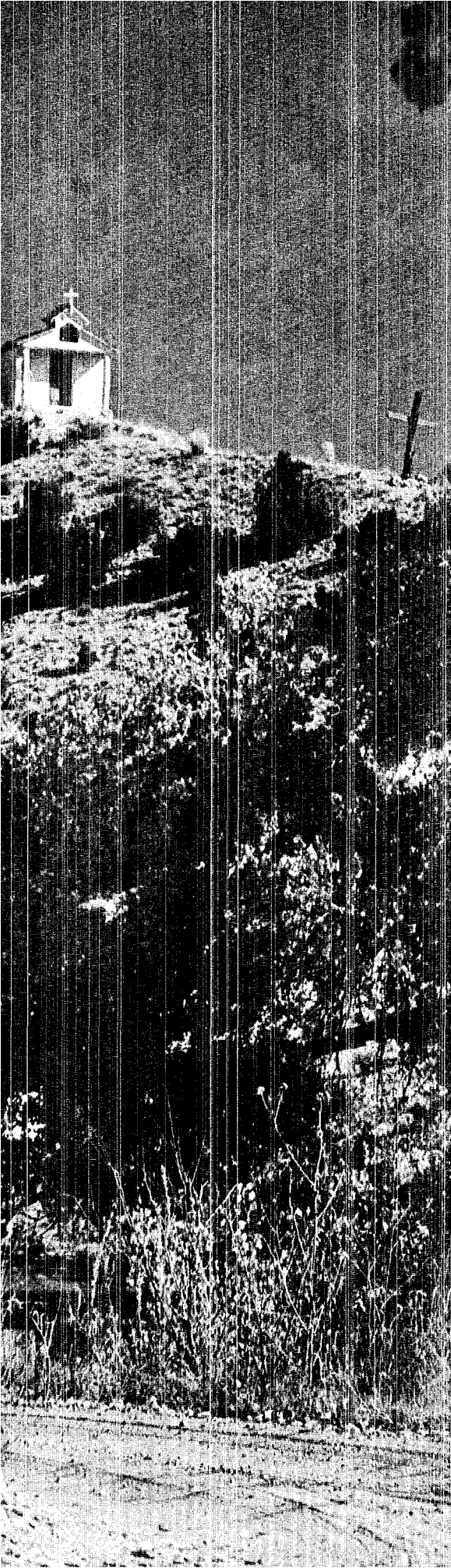


"Close to the sun in lonely lands . . ." The quaint and ancient town of Truchas sprawls over a lonesome plateau visible across the valley from Los Alamos, at an elevation of 7,600 feet in the Sangre de Cristo range. The town's history goes back to 1750. Only in very recent years has it had a paved highway, electric lights and television.



*"Before it is Altogether Too Late  
Take the Crooked Road from Santa Cruz  
to Chimayo of the Weavers, Cordova of  
the Wood Carvers and High Lonesome Truchas"*

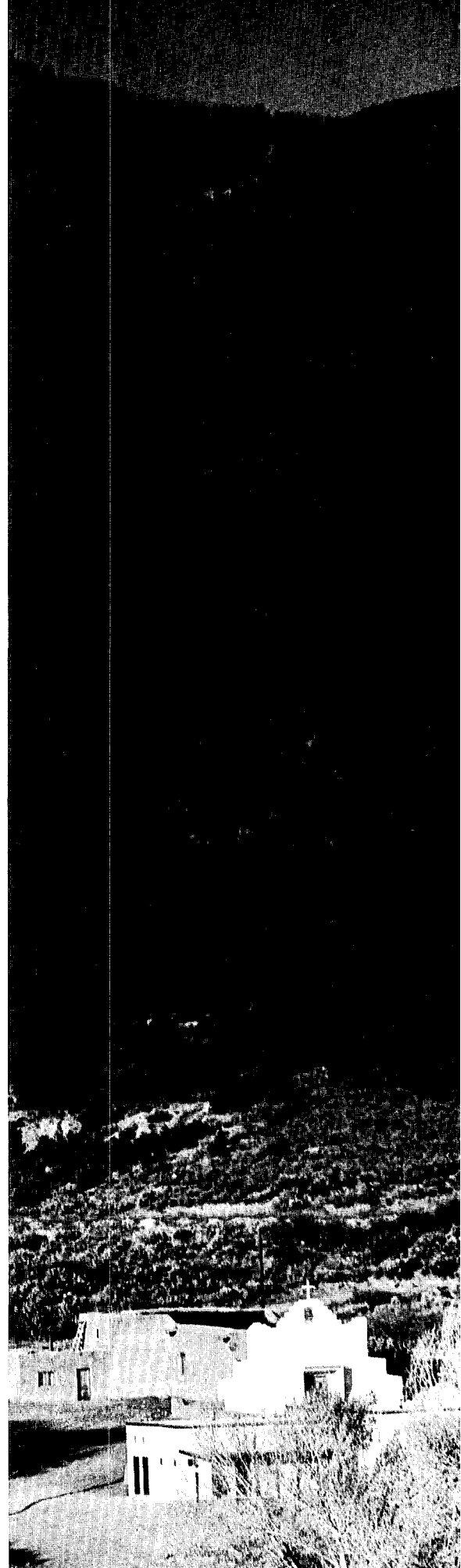
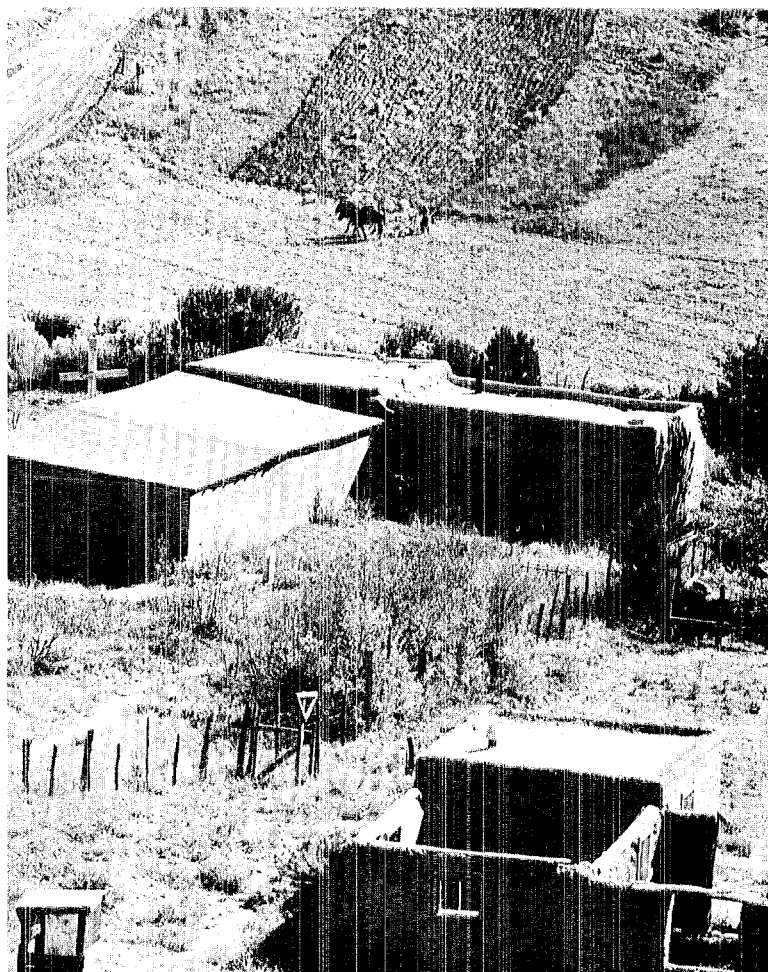
"THEIRS ARE THE DEEP PLACES OF TH



# EARTH; THE STRENGTH OF THE HILLS . . ."



Hidden deep in the hills of northern New Mexico, there are still places where the old customs prevail, and highways, electric lights and television are just beginning to make inroads. From the little neighborhood chapel on a high hill outside Santa Cruz (left) to the white church at Picuris pueblo (right), life seems to go on as it has for generations. The ancient wooden acequia at Trampas (below, left) still carries the village water supply; the steep hills of Cordova are still ploughed in the old way (below, right), and adobe is still the only acceptable building material. It will not be so for long—only a short stretch of the rough old road from Truchas to Peñasco remains unpaved, and with the advent of the tourist hordes, this unspoiled glimpse into New Mexico's past will fade into history.



"How can the Los Alamos Scientific Laboratory, as the largest scientific research institution in the region, be of greater service to the colleges and universities of the Rocky Mountains and the Southwest?"

That question was posed by Dr. Norris E. Bradbury, LASL director, to representatives of 22 universities from Idaho to Texas who met at Los Alamos, December 17.

Some 50 deans of graduate schools, chairmen of departments of physics, chemistry and engineering, and several Atomic Energy Commission officials heard Los Alamos staff members describe LASL's varied facilities and programs and were conducted on tours to some of the technical areas which have been removed from national defense security classification.

Purpose of the conference, the second of its kind in the Laboratory's 21-year history, was to explore the areas of possible collaboration in research and education between LASL and the regional schools, and to explain to the group the Laboratory's proposal to build a \$50 million accelerator for high energy physics research.

"If Congress agrees that we should have such a facility at Los Alamos," Dr. Bradbury said, "it could not possibly be for the exclusive use of Los

Alamos—it would have to be for the good of the region—and the nation."

Paul McDaniel, AEC's director of research, spoke enthusiastically about the accelerator project, and said he was certain the universities of the area would be able to participate in its use and have a voice in its management. He said the AEC was ready and willing to work with LASL and the universities in preparing the necessary documents in support of the plan.

He cited LASL's abundance of scientific talent and its advanced technology as one reason for locating the proposed accelerator here, and suggested that the universities of the region could develop "user" groups to exploit this and other Los Alamos facilities. He said the size and cost of the accelerator almost dictates it should be a national facility open to all.

Dr. George A. Kolstad, also of the AEC division of research, pointed out that the accelerator would be of great interest not only to nuclear physicists but to biologists, chemists and engineers because of the extremely high intensity of its beam.

Drs. Louis Rosen and Darragh Nagle of LASL's Physics Division, explained details of the proposed accelerator, a 2,000-foot-long straight-

line, high-intensity proton beam machine designed to produce pi-mesons and a great variety of other subatomic particles.

Rosen explained the tools and techniques developed in the last 30 years to study atomic processes are too crude for probing the nucleus of the atom, the ultimate source of all energy. New devices, such as the proposed "meson factory" as it is locally known, would open up new avenues of research into the fundamental nature of the universe, he said.

Of possible practical applications, Rosen pointed out the standard of living of any society is largely dependent upon the amount of useful energy available to it—and that much basic research will have to precede any new discoveries in sources of energy.

Dr. Raemer Schreiber, technical associate director of LASL, told of other work of the Laboratory. The guests also learned about LASL's increasingly active role in education—employment of university faculty members for summer work and during Sabbatical leaves, its graduate thesis program, summer graduate student employment, summer consultants, and the University of New Mexico's unique graduate center for advanced education which is operated for Los Alamos people.

An ad hoc committee was organized to prepare a recommendation on the accelerator proposal. The report is expected in early spring. Members of the committee are Drs. George A. Kolstad and George L. Rogosa of the AEC's Division of Research, Washington, D.C.; Drs. Richard F. Taschek and John H. Manley of LASL; Dr. E. Gerald Meyer, Dean of Arts and Sciences, University of Wyoming; Dr. Wesley Brittin, Chairman of the Department of Physics, University of Colorado; Dr. William

Members of ad hoc committee, representing the Laboratory, AEC, and region's colleges and universities begin the task of preparing a recommendation on LASL's proposal to build a new multi-million-dollar accelerator.



Parish, Dean of the Graduate School, University of New Mexico; Lt. Col. Daniel Overton, Division of Military Application, U.S. Atomic Energy Commission; and Dr. Harry F. Fechter, Professor of Physics, Idaho State University.

Attending the meeting:

ARIZONA: Dr. Richard Stoner, Chairman, Physics Department; Dr. LeRoy Eyring, Chairman, Chemistry Department; Dr. Radha Roy, Professor of physics, Arizona State University.

Dr. Herbert D. Rhodes, Dean Graduate College; Dr. Albert B. Weaver, Head, Department of Physics, University of Arizona.

COLORADO: A Raymond Jordan, Dean, Graduate School; Dr. George Lucas, Associate Professor of Chemistry, Colorado School of Mines.

Dr. Adrian Dahl, Chairman, Radiation Institute; Dr. L. N. Hadley, Professor of Physics and President, Colorado State University Research Foundation, Colorado State University.

Dr. K. D. Timmerhaus, Associate Dean, College of Engineering; Dr. Wesley Brittin, Chairman, Department of Physics, University of Colorado.

Dr. James Perdue, Dean of the College of Arts and Sciences; Dr. Edward Sickafus, Assistant Professor of Physics, University of Denver.

IDAHO: Dr. Stanley H. Vegors, Chairman, Physics Department; Dr. Harry R. Fechter, Physics Professor, Idaho State University.

Dr. Lorin W. Roberts, Associate Professor of Botany; Dr. M. M. Renfrew, Head, Division of Physical Sciences, University of Idaho.

MONTANA: Dr. Donald W. McGlashan, Professor of Mineral Dressing, Dr. John G. McAslin, Associate Professor of Physics, Montana School of Mines.

Dr. Irving Dayton, Head, Physics Department; Dr. Charles Caughlan, Professor of Chemistry, Montana State College.

# THE DOOR OPENS WIDER

LABORATORY, REGION'S SCHOOLS  
EXPLORING POSSIBLE COLLABORATION  
IN RESEARCH AND EDUCATION

Dr. Mark Jakobson, Professor of Physics, Montana State University (on Sabbatical at Los Alamos Scientific Laboratory).

NEVADA: Dr. Thomas O'Brien, Graduate School; Dr. David F. Dickinson, Department of Nuclear Engineering, University of Nevada.

NEW MEXICO: Dr. Clarence Stuckwisch, Department Head, Chemistry; Dr. James P. Zietlow, Graduate Dean, New Mexico Highlands University.

Dr. Marvin H. Wilkening, Chairman, Physics Department, New Mexico Institute of Mining & Technology.

Dr. Earl Walden, Dean, Graduate School; Dr. Harold Daw, Head, Physics Department, New Mexico State University.

Dr. Christopher Leavitt, Department of Physics; Dr. William Parish, Dean of the Graduate School, University of New Mexico.

TEXAS: Dr. John C. Allred, Vice President, University of Houston.

Dr. Gerald Phillips, Professor of Physics, Rice Institute.

UTAH: Dr. Dwight Dixon, Chairman, Physics Department, Brigham Young University.

Dr. Henry Eyring, Dean, Graduate School; Dr. Calvin D. Wood, Department of Physics, University of Utah.

Dr. Eldon J. Gardner, Dean of College of Science; Dr. John K. Wood, Head, Department of Physics, Utah State University.

WYOMING: Dr. E. Gerald Meyer, Dean of Arts and Sciences; Dr. Willis Everett, Physics Faculty, University of Wyoming.

WASHINGTON, D.C.: Dr. Paul W. McDaniel, Dr. George A. Kolstad, Dr. George L. Rogosa, Division of Research; Dr. Russell S. Poor, Division of Nuclear Education and Training; Lt. Col. Daniel Overton, Division of Military Application, U.S. Atomic Energy Commission.

ALBUQUERQUE: Kenner F. Hartford and Silas A. Upson, Albuquerque Operations Office, U.S. Atomic Energy Commission.

LOS ALAMOS: Charles C. Campbell, Los Alamos Area Office, U.S. Atomic Energy Commission.

# CALL IT DETERMINATION

Once barred from science classrooms because of her sex,  
this lady physicist has enjoyed careers both as teacher  
and researcher since receiving her doctorate  
thirty three years ago.

"It was rough," Alice Hall Armstrong said, recalling her experiences of four decades ago as a graduate student of physics on the Harvard campus.

Miss Armstrong plans to retire shortly as a LASL staff member and assistant P-10 group leader. Her 33 years in science has spanned careers both as teacher and researcher.

Enrolled at Radcliffe College but attending courses at Harvard through a cooperative program of the two schools, Miss Armstrong was barred from some science courses simply because she was a woman.

But she was determined and there were enough professors who didn't object to the presence of a woman graduate student in the physics classroom. She continued her studies, though they were interrupted by a job and a year-long illness, and in 1930, she became the first woman to earn a doctorate in physics through course work at Harvard.

"Some faculty members were bitterly opposed to women graduate students," she said. Once, when a regional meeting of the American Physical Society was held on campus, Miss Armstrong had to use a side door to

attend a luncheon meeting at the Faculty Club.

It was by sheer accident that she got in physics in the first place. Entering Wellesley College as a language major, she signed up for a physics course simply to fulfill the school's science requirement. She'd had no science whatever in high school. That she chose to continue in science was largely due to the influence of her advisor—at that time one of only four women in the country holding a Ph.D. in physics.

Following graduation in 1919, Miss Armstrong worked for the National Bureau of Standards for three years before enrolling as a graduate student at Radcliffe. She took her masters' degree and stayed on to work for her doctorate. Plans for study in European laboratories at this point in her career were spoiled by bad luck. Two weeks before her scheduled departure on an international scholarship, illness struck and she was not allowed to do any reading for an entire year. Later, she spent two more years as an assistant in biophysics at Rockefeller Institute for Medical Research in New York before finally returning to Harvard to finish work for

her doctorate.

It was to be 20 years before Los Alamos got Alice Hall Armstrong. "I had always said that the one thing I would not do was teach," she recalls. But teach she did. Wellesley had been after her for years, and in 1930, "I decided to give it a whirl." Starting as an assistant professor of physics, she later became an associate professor, then professor of physics and, in 1945, chairman of the department.

When Miss A, as she has come to be known around the lab, came to Los Alamos in 1950 to help Group Leader Louis Rosen in P-10, she joined LASL only as a temporary employee on leave from Wellesley. "I had been teaching for so long and felt so out of touch with research that I wanted to come here for the stimulation offered by the group's work," she said.

Still deep in projects at the end of her first year, she had her leave extended for another year. When she returned to Wellesley in 1952 she was still mulling over her offer of a permanent place at LASL.

"It was a difficult decision," she said. "I loved the academic atmosphere at Wellesley but the work of



Miss Alice Hall Armstrong  
and one of "my girls"

P-10 was fascinating and I couldn't resist it." At the end of the academic year she returned to Los Alamos, permanently.

The biggest part of her job in P-10 has been the responsibility for "my girls"—about a score of women technicians who do microscopic analyses of nuclear emulsion plates, photographic images of the tracks left by fast moving nuclear particles. Her work has included hiring, training and supervising several dozen women through the years. "No one could have done the work more smoothly," Rosen said. But beyond that, Rosen said, she has been the prime mover in many of the group's other experimental programs. "Her tremendous

flexibility," in his words, "is one of Miss A's most outstanding qualities."

A few years ago, she became one of the first scientists to participate in explorations of charged particles in the Van Allen belts and gave the American Physical Society's first paper concerning flux and energy distribution of protons in the lower Van Allen belt.

Accomplishing this work involved lofting packages of nuclear emulsion plates into space aboard Atlas rockets. To insure their proper handling, Miss Armstrong followed her packages into what she had envisioned the "man's world" of Cape Canaveral. "By then, things were different—I found women were accepted com-

pletely," she said. "In fact, there were several others working there, too."

Of all her laboratory projects, Miss Armstrong found the rocket work "by far the most exciting, although not the most profound physics." It was a new field, she said, "and I always love anything that's new."

Although she was born and spent much of her life in Massachusetts, she will retire to a new home she has built on Old Pecos Road in Santa Fe. She's looking forward to participating in cultural activities available in the Capital City, and sleep. "I haven't had time to get enough sleep for years," she said.

The thrill is gone. At least it soon will be.

Next year, possibly sometime in June, the State Highway department will begin the \$635,000 job of straightening and flattening the nine roller-coaster miles of State Highway 30 between Espanola and the Los Alamos road.

For thousands of youngsters and many adults who travel the breathtaking route only occasionally, the new road will take a lot of fun out of life, but for hundreds of commuters making the trip twice a day, the job is long overdue. In its present rolling condition, the road hides from the driver's view huge trucks, stray cattle and the rushing waters of flash floods in the deep dip bottoms. The new road, with concrete block and pipe culverts replacing the dips, will be far less exciting but flatter, faster and safer.

But the flattening isn't the whole story. The Espanola Y just east of Totavi on the Los Alamos-Santa Fe highway will be changed, eliminating the stop sign and speeding Los Alamos-Santa Fe traffic.

Highway 4 in the vicinity of the junction will become four lanes and Espanola-bound travelers from Los Alamos will use a turn-off, or holding, lane, yielding to westbound Los Alamos traffic before making the turn toward Espanola. Los Alamos-bound Espanola travelers will merge with the non-stop westbound traffic.

Beyond the Y on Highway 30, the road will take a wider curve, running about 100 feet east of the present route, then cross back to follow the existing route immediately to the west of it. At Guachapungue, the new road again crosses east, joining the old Denver-Rio Grande railroad bed to by-pass the congested village. It will rejoin the old road at the Guachapungue arroyo where it will become four lanes to the present junction with US 84 and 285. The widening at this point will require the razing of a number of business buildings on the east side of the present road.

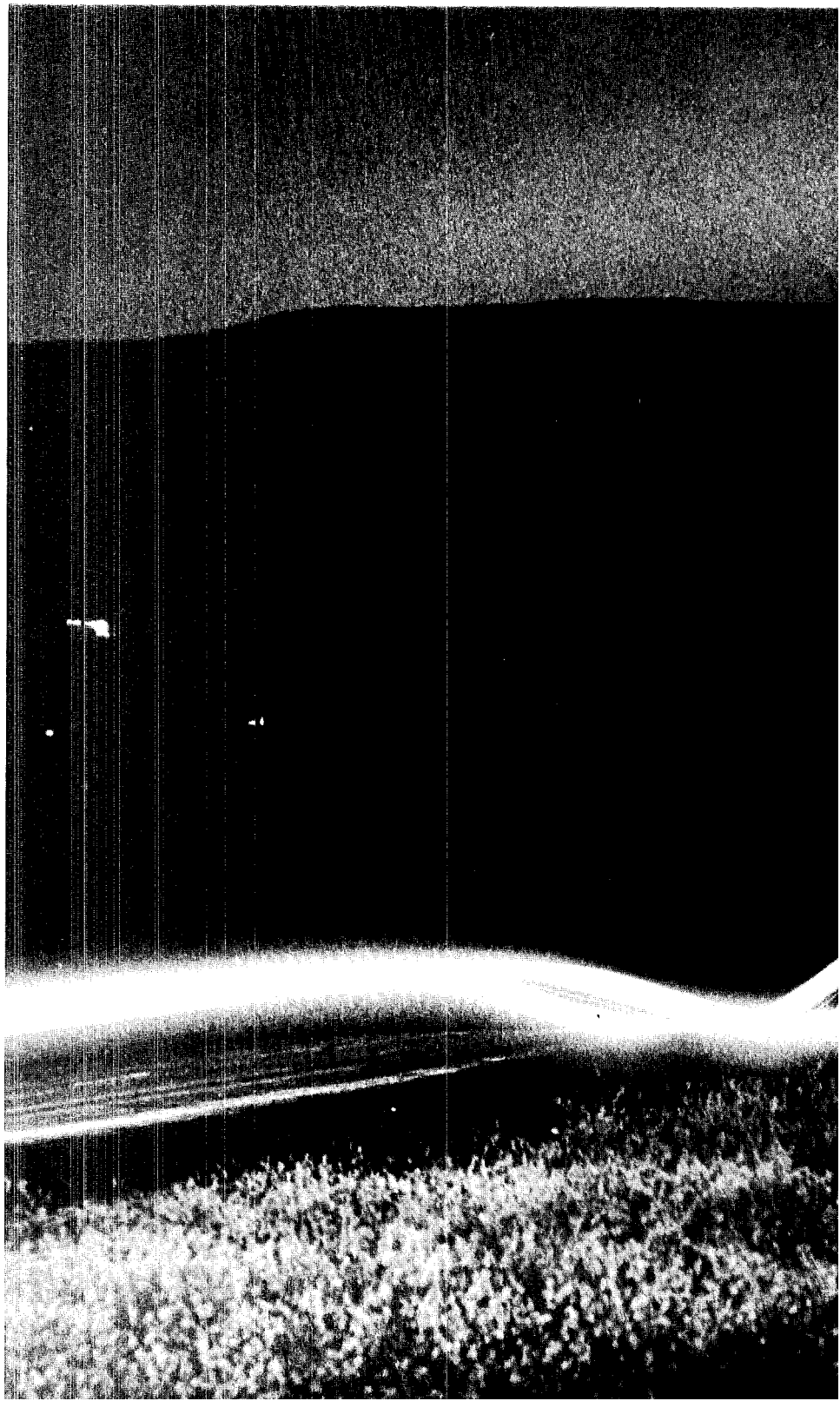
In addition to the work on State Road 30, the contract will include elimination of the two Totavi dips,

known officially as the Bayo Arroyos, and straightening of State Road 4 at this point. Triple concrete block culverts will replace the present spillways.

The Highway Department is tentatively planning to call for bids on the construction project in June or July next year.

# UP AND

## THE NEW



# DOWN AND ALMOST OUT

ROAD WILL BE SAFER BUT NOT NEARLY SO MUCH FUN



# THAT WAS 1963



On hand since the beginning, Dorothy McKibbin retired after 20 years. The Santa Fe office of the Laboratory which she managed was closed June 28 after Dr. Bradbury unveiled a plaque at 109 East Palace Avenue.

Meson physics, one of the new frontiers of scientific exploration, drew physicists from the United States and Europe for two weeks of intense study and discussion. The Laboratory has bid for construction of a \$45 million proton accelerator that would open new avenues of basic research for the entire Rocky Mountain region.

1963. Twenty years had passed since bulldozer and slide rule and high wire fence had moved covertly onto the remote Pajarito Plateau.

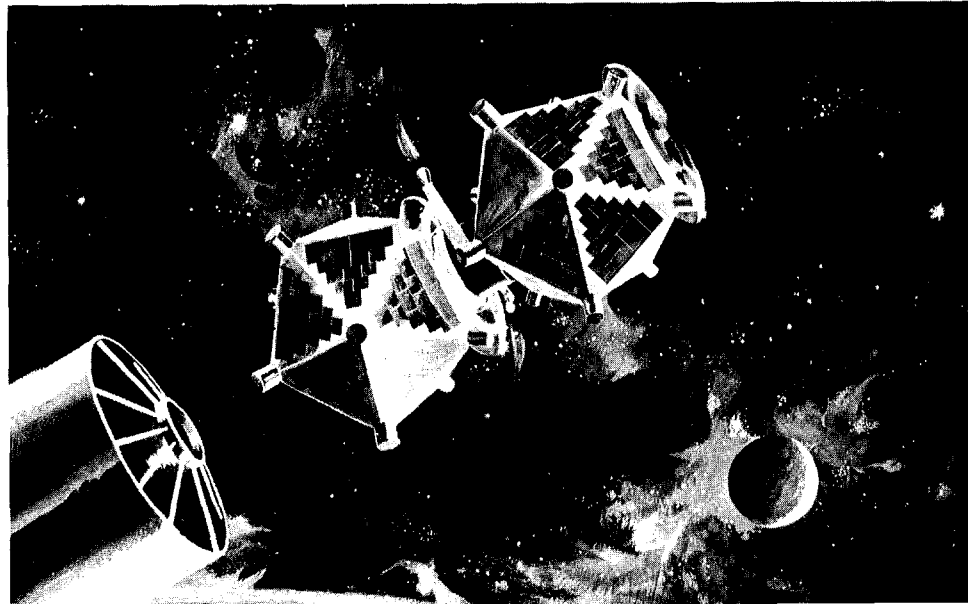
Since two decades traditionally are a sort of milestone, the twentieth anniversary of Los Alamos Scientific Laboratory was regarded with a special sort of affection.

There were the first "20-year service pins," some retirements based on 20 years of service on the Hill, some nostalgic and prideful looking backward and a good deal of looking forward.

It was the year the nations of the world took, as Director Norris Bradbury put it, "a small step toward the abolition of war." The treaty banning above-ground nuclear weapons testing was of great interest in Los Alamos, but there was abundant evidence that the years ahead would be as busy and technically exciting as those behind.

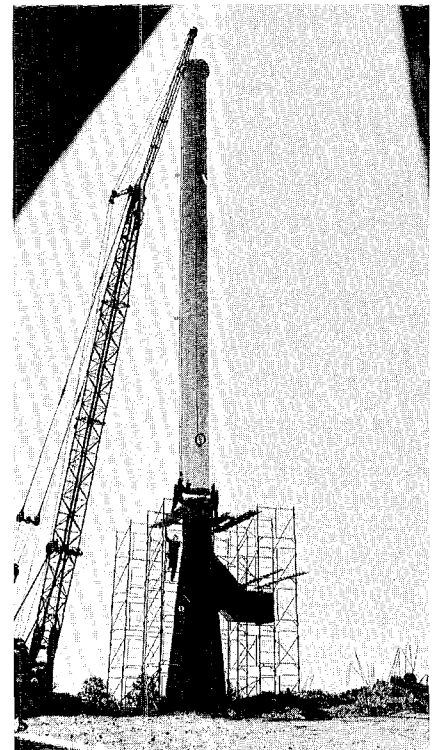
Some of the outstanding events of the Laboratory's twentieth year are recalled in the photos on these pages.

Project Vela Hotel, a five-year effort to develop means to detect nuclear bursts in space reached a successful climax in October when two detection satellites bearing LASL instruments were posted in orbits 60,000 miles in space.



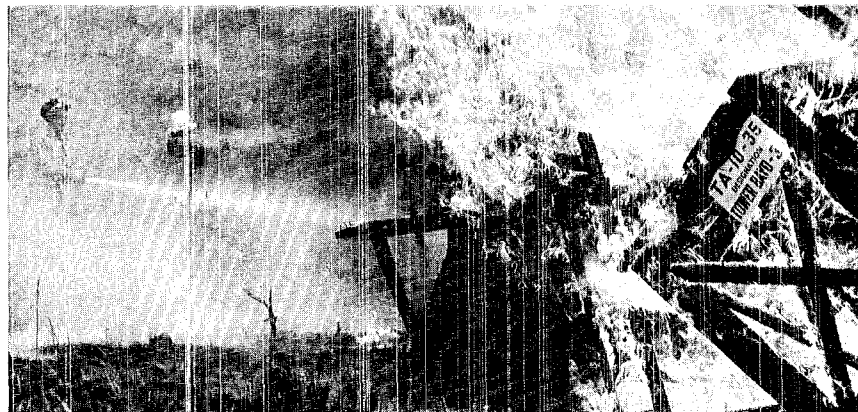


The nation was assured, through a Bradbury press conference (above), that limited test ban treaty will not mean an end to progress in nuclear weaponry. Nor, the Director said, would the Laboratory's many research programs be jeopardized. Erection of UHTREX ventilation stack (right) was symbol of future. More than \$50 million in technical area construction proceeded during the year. As the future took shape, the Laboratory in late summer opened a public museum (below) in AP Building. Exhibits, many of them classified until now, trace LASL history, achievements and programs.



One of the Laboratory's primordial outlying technical sites was deactivated in the spring. TA-10 in Bayo Canyon was decontaminated by Health Division and turned back to the AEC for public use.

Awards were many. Here Bill Ogle receives the Navy's Distinguished Service Medal for his work in Pacific weapons testing. James Taub and Louis Rosen received E. O. Lawrence Awards from the AEC and Dr. J. Robert Oppenheimer, the Laboratory's wartime director, was the recipient of the Enrico Fermi Award.



## LABORATORY ANNOUNCES POST-DOCTORAL PROGRAM

A new program of post-doctoral appointments for one or two years for young scientists and engineers has been announced by the Laboratory Director's office.

Appointments will be open to selected young men and women, preferably in the 25-to-30-year age bracket, who have received the Ph.D. degree within the three years immediately preceding the appointment. They must be U.S. citizens and must be granted an AEC Q clearance in order to qualify.

Salaries and fringe benefits will be comparable to those received by regular Staff Members. Appointments will be made for one year, subject to renewal for a second year.

The Personnel Department will recruit candidates on university campuses, arrange for interviews, and issue offers approved by the Director's Office. The appointees will be assigned to the Director's Office, but will carry out research in the Division which requested the appointment.

According to the announcement, it is the intent of the program that the appointees share in promoting research and development projects to the mutual benefit of the individual and the Laboratory. It is hoped that the program will increase the flow through the Laboratory of high-quality young people and at the same time provide them with valuable post-doctoral experience in their chosen field.

## NEW HIRES

Following are LASL new hires:

Doreen S. Bourne, Los Alamos, K-DO.

Jose Claudio Duran, Santa Cruz, N.M., SP-4.

Teodoro Martinez, Jr., Espanola, N.M., H-7.

Charles C. Shampine, Toledo, Iowa, N-3.

Robert Murray Cantwell, Pittsburgh, Pa., T-12.

Eddie Dean Millsap, Espanola, N.M., T-7.

Della M. Johnson, Los Alamos, N.M., AO-DO.

Joseph E. Sul, Albuquerque, N.M., N-4.

Harold B. Davis, Albuquerque, N.M., CMB-6.

Melvin Kile O'Neal, Cumberland,

Maryland, N-3.

Betty Jean Burnett, Los Alamos, J-10.  
Billy Edward Todd, Albuquerque, N.M., N-3.

Gloria E. McCrary, Los Alamos, CMF-2.

Evelyn Irene Ward, Los Alamos, J-6.  
Gilbert G. Mascarenas, Los Alamos, PER-4 (Casual).

Wiley Bee Perry, Jr., Atlanta, Georgia, GMX-6.

Cecilia J. Martinez, Santa Cruz, N.M., SD-0.

Susan Kanow, Los Angeles, California, SP-LA.

Carol N. Roberts, Los Alamos, H-4.  
Domitila P. Flock, Los Alamos, Business Office.

Lawry Webb Mann, Yakima, Washington, T-5.

## WHAT'S DOING

FILM SOCIETY: Civic Auditorium, films shown 7 and 9 p.m. unless otherwise noted. Admission by \$3 season ticket or 90 cents single admission.

Wednesday, January 15, "The Strong Arm of the Law." Comedian Peter Sellers in the guise of head hood leads a most unlikely gang of desperados in another tilt with the forces of law and order. (91 minutes).

Wednesday, February 19, "Shoot the Piano Player." French comedy-drama. (85 minutes).

OUTDOOR ASSOCIATION: No charge, open to the public. Contact leader for further information on specific hikes.

Sunday, January 19, Snowshoe hike on Pajarito Mountain. Leader, Dibbon Hagar.

Saturday, February 1, Snowshoe hike. Leader Don Rose.

LOS ALAMOS HIGH SCHOOL POOL: Winter schedule for public swimming. Adults 35 cents, students, 15 cents.

Monday, 7 to 9 p.m. Open

Tuesday, 7 to 9 p.m. Adults

Saturday 1 to 5 p.m. Open

Sunday 1 to 5 p.m. Open

INTERNATIONAL FOLK DANCE CLUB: Open to the public. Meets the first Tuesday of each month, 8 p.m., Recreation Hall.

SWIMMING CLUB OF LOS ALAMOS, INC.: Membership open to all adults interested in swimming. Club meets every Tuesday, 7 to 9 p.m.

## The Technical Side

Presented at the American Physical Society meeting, California Institute of Technology, Pasadena, California, December 19-21:

"P-P Scattering Near the Interference Minimum," by John E. Brolley, Jr., John D. Seagrave, both of P-DOR, and Jerome G. Beery, P-10.

"An Absolute Velocity Gauge," by John D. Seagrave, John E. Brolley, Jr., both of P-DOR, and Jerome G. Beery, P-10.

"Analysis of Proton-Proton Scattering Near the Interference Minimum," by Martin L. Gursky, T-11, and Leon Heller, T-DO.

"(He<sup>3</sup>,n) Reactions," by John H. Manley, DIR OFF, and William E. Stein, P-2.

AIME National Refractory Metals Symposium, Los Angeles, California, December 9-10:

"Fabrication of Refractory Metal Shapes by High Energy Rate Extrusion" by D. J. Sandstrom and Gale S. Hanks, both of CMB-6.

Scientific Computing Symposium on Large Scale Physical Problems, Yorktown Heights, New York, December 9-11:

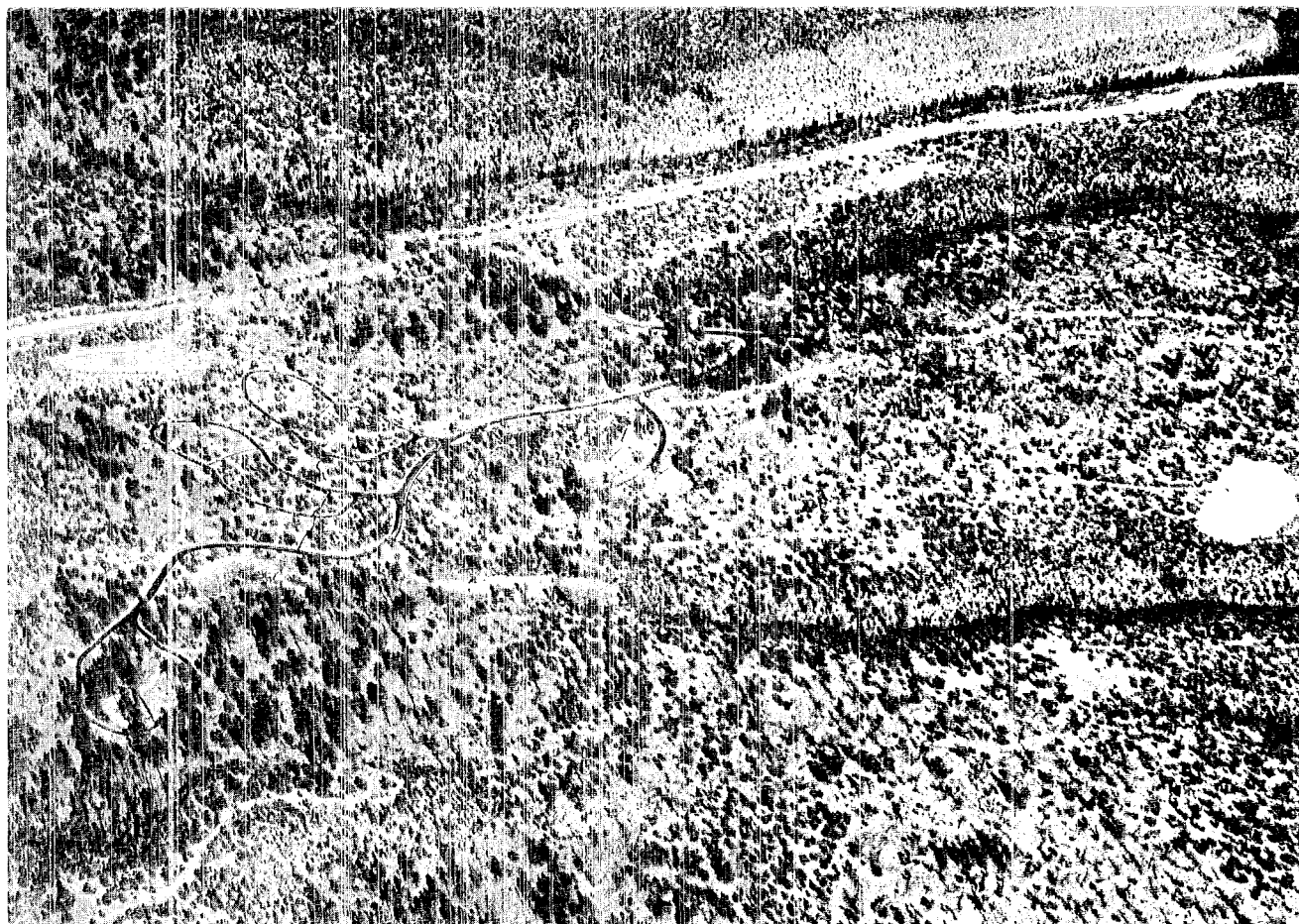
"Results of Numerical Calculations of Wakes and Jets" by Jacob E. Fromm, T-3.

Tri-Section Meeting of the American Industrial Hygiene Association, New York City, December 6:

"Activities of the American Industrial Hygiene Association" by Harry F. Schulte, H-5.

Chemistry Department Seminar, University of New Mexico, Albuquerque, December 13:

"Problems in the Organic Mechanism of Life" by F. Newton Hayes, H-4.



Aerial photograph of the new Bandelier campground atop Frijoles Mesa shows the loops of paved road which connect the 100 camping spaces. By spring, the nearly-completed facility will replace the old campground in the canyon.

## CAMPERS GET A PLACE IN THE SUN

By spring, all camping at Bandelier National Monument will have been moved from Frijoles creek to the top of Frijoles Mesa, just south of Highway 4. Access is by a new road turning west a little short of the fire lookout tower.

Part of the old camping and picnic area will be converted to picnicking,

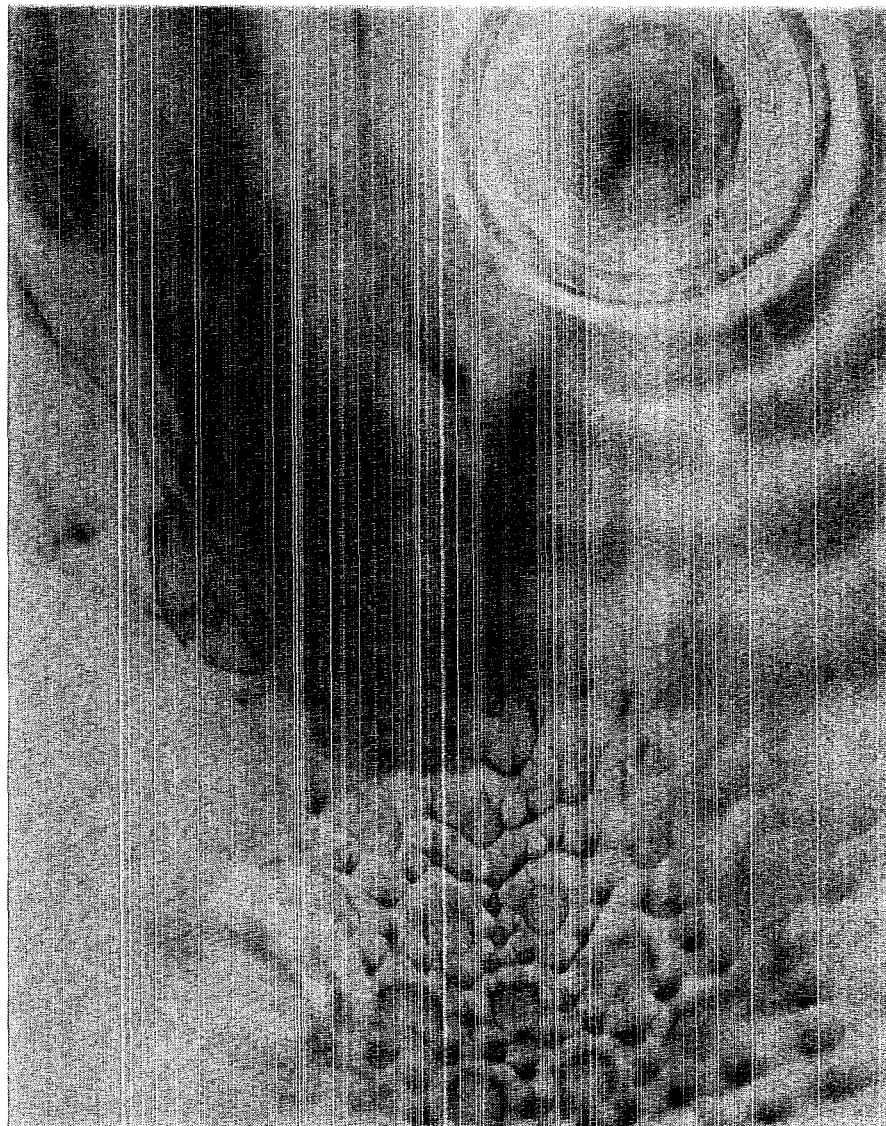
with adjacent parking, Superintendent Al Hensen reports. The rest will be allowed to revert to nature, with some marked nature trails in addition to the existing main trail up and down the canyon.

The new area, facing south and enjoying a much longer day in the sun, has 100 camping spaces, with tables and fire grills; and three large double comfort stations, with heat and running water. Water also is piped to all three of the new camping circles, which are laid out in loops off the access road. Most of the spaces will accommodate trailers, but there are no hookups for them. There is, however, a sewage disposal station for trailers.

The first camping loop is completed

and the other two will be ready shortly although the camping "season" in Bandelier does not start until spring. Both the new and the old areas will be open all winter, for picnickers and very hardy campers. There are no present plans for a visitor center at the new area. However, Hensen hopes to be able by spring to establish a campfire circle in the old quarry adjoining the new camp area. The quarry provided the stone used by the C. C. C. in building the present lodge and headquarters in Frijoles canyon during 1937-40.

Trails lead from the camping circles to the quarry, and a new trail is being built from the quarry to the rim of the canyon overlooking Tuyoni and Ceremonial Cave.



*Photographic Interpretation by William Thomson*

Modern, high-speed electronic computers construct, in seconds, mathematical models of anything from an egg-beater to a nuclear power reactor. They enable man to come to grips with age-old questions of cellular biology as well as equally complex problems of travel in deep space. At Los Alamos, one of the world's most advanced computer centers, scientists use mathematical machines to probe both the micro-cosmos and the macro-cosmos.

*Qualified applicants are invited to send resumes to:  
Director of Personnel,  
Division 63-123*



All qualified applicants will receive consideration for employment without regard to race, creed, color or national origin. U.S. citizenship required.